

SEXUAL RECEPTIVITY AND CONCEPTION RATE OF RABBIT DOES FED SELECTED PERENNIAL FORAGES IN ILE-IFE, NIGERIA

Ola S.I.*, Williams O.S., Obamjure I.A., Okunlola A.M.

Dept. of Animal Sciences, Faculty of Agriculture, Obafemi Awolowo University, 220005, Ile-Ife, Nigeria

*Corresponding author: idowuola@ymail.com

ABSTRACT

Moringa oleifera, *Tephrosia candida* and *Cajanus cajan* are perennial shrubs that can provide fresh forages to rabbits in a forage based production system of small holder operations, especially during the dry season. This study compared the sexual receptivity parameters (vulva colour, mating duration and, copulation rate), conception rate, litter performance and productivity of rabbit does fed these forages to those fed the conventional *Centrosema pubescence* or sole concentrate diets. Fifty heterogenous does were allotted equally to the five treatments (four forage based diets and the control diet). The forages were offered *ad libitum* plus a supplementation of concentrate at 2 % of body weight. After 2 weeks of flushing the does were randomly mated to one of the 10 bucks. Does were mated again one week after weaning of kits (at 5 weeks). During both reproduction cycles the sexual receptivity parameters were observed while the conception rate was determined at palpation and parturition. Litter size and kits weight at birth were also recorded at parturition and the productivity index calculated as the product of conception rate and litter size. Purple was the most exhibited vulva colour in all the does fed the different forages as well as the control group fed only the concentrate diet, while reddish vulva was the least observed. Mating duration was faster for does fed *Moringa* and concentrate diets. The preliminary data of the fertility were lower in the *Cajanus* fed does with only 60 % compared to over 70 % in *Moringa*, *Centrosema*, *Tephrosia* and Concentrate groups. Litter size was the highest in Concentrate fed does (5.8 born alive). Among the forages groups *Moringa* and *Tephrosia* gave a higher litter size than *Cajanus* and *Centrosema* (4.8 and 4.9 vs 4.2 and 4.0 born alive, respectively). Overall productivity was significantly higher for the control group (4.8 born alive/mating), intermediate for does fed *Moringa* or *Tephrosia* (3.7 and 3.4 born alive/mating, respectively) and lower with the *Cajanus* or *Centrosema* diet (2.5 and 2.9, respectively). Thus for dry season, feeding of rabbit under the Ile-Ife conditions, *Moringa* or *Tephrosia* forages supplemented with concentrate diet seems to be an interesting option. However, the results have to be confirmed using a larger number of does.

Key words: Rabbit, perennial forage, sexual receptivity, conception rate, litter size.

INTRODUCTION

Dry season feeding is the greatest challenge that faces forage based rabbit operations in Nigeria. This is due to the non availability of the annual fodder crops (such as *Centrosema pubescence*, *Tridax procumbens*, *Panicum maximum*, *Aspilia africana* etc) during the dry period of the year. Perennial forage plants that produce foliage all year round have been suggested to the rescue. Among the perennial forages that are currently been evaluated for their effects on rabbit performances are *Moringa oleifera* (Odeyinka et al, 2008; Djakalia et al., 2011) and *Tephrosia candida* (Babayemi and Bankole, 2006; Odedire and Babayemi, 2007). However there are no adequate reports on the reproductive responses of the rabbits to these forages.

To better combat the problem of dry season feeding *Moringa oleifera*, *Cajanus cajan* and *Tephrosia candida* were recently introduced in our farm. Thus the aim of this study was to determine the sexual receptivity and the conception percentages of rabbit does fed *Moringa oleifera*, *Cajanus cajan* and *Tephrosia candida* as the main diet, in comparison to the conventional concentrate or *Centrosema* diets.

MATERIALS AND METHODS

Animals and experimental design

The study was carried out at the University Research farm from April to June 2011. The study involved fifty rabbit does and ten rabbit bucks of multiple crossbred genotype and phenotype (derived from New Zealand White, California White and Chinchilla). The does were randomly allocated equally to 5 treatments while the bucks were used for random mating of the does. The experimental treatments were: Concentrate – Rabbit does received only concentrate diets at 6 % of body weight (Control); Moringa; Tephrosia; Cajanus; and Centrosema; *i.e* Rabbit does were fed *Moringa oleifera*, *Tephrosia candida*, *Cajanus cajan* or *Centrosema pubescence* foliage, respectively, *ad libitum* and a concentrate diet supplement at 2 % of body weight.

The does were 12-18 months old and weighed 1400–2200 g. Eighteen nulliparous and 32 multiparous were used. The bucks were slightly older and heavier and were fed the sole concentrate diet which contained 16 % CP and 2480 ME Kcal/kg. All rabbits were caged individually in battery cages.

Data collection and statistical analysis

All does were presented to a buck twice, first after 2 weeks of experimental feeding and secondly 6 weeks after parturition *i.e* one week after weaning of kits. Natural mating was applied and was carried out in the cold hours of the day (09.00-11.00 h or 16.00 – 18.00 h). To determine the sexual receptivity of the does the following parameters were registered when the doe was presented to the buck; 1) vulva colour *i.e* white, purple or red; 2) Mating duration *i.e* the interval between pairing and observed mating (duration <5 min, was taken as fast mating while duration >5 min was regarded as slow mating duration); 3) Copulation rate *i.e* the number of ejaculations allowed by the female within 10 minutes of pairing with buck.

Conception was tested at 14 or 15 days post mating by abdominal palpation. Females with a negative palpation were mated the same day recording again sexual receptivity parameters. Litter size and weight of each pregnant doe was recorded at parturition. Results from the first and second presentation to a buck were pooled. Percentage occurrences of the receptivity parameters were compared within and between each treatment group by chi square analysis. The overall conception rate (or fertility) considered as a variable of Bernoulli (trait 0-1) was analyzed by analysis of variance (and Duncan test) taking into account the fixed effect of the treatment. Data of weights, litter size and productivity were compared between treatments by analysis of variance using the same model and Duncan test.

RESULTS AND DISCUSSION

Figure 1 shows the percentage of occurrence of the different vulva colors of does fed different diets. The appearance of red or purple vulva has been well correlated to mating readiness or estrus in rabbit does (Rodriguez *et al.*, 1989) but the influence of the diet, particularly forages, on this parameter is little known. Our result showed that purple was the most exhibited vulva color in all the does fed the different forages, as well as the control group fed only concentrate diet, while reddish vulva was the least observed (Figure 1). Does fed Moringa forage had 16.5% occurrence of whitish vulvas compared to 31, 25, 25 and 50 % in Concentrate, Tephrosia, Cajanus and Centrosema groups, respectively. Conversely occurrence of estrus vulvas (*i.e* purple and reddish vulvas) were 83.4 , 68.8 , 75.0, 75.0 and 50 % , in Moringa, Concentrate, Tephrosia, Cajanus and Centrosema groups, respectively (Table 1). Consequently, Moringa forage may contain factors that increase estrus exhibition more than the other forages. Moringa plant has actually been described severally as a miracle plant with exceptional nutritional qualities for both man and animals (Makkar and Becker, 1996; Fuglie, 2001).

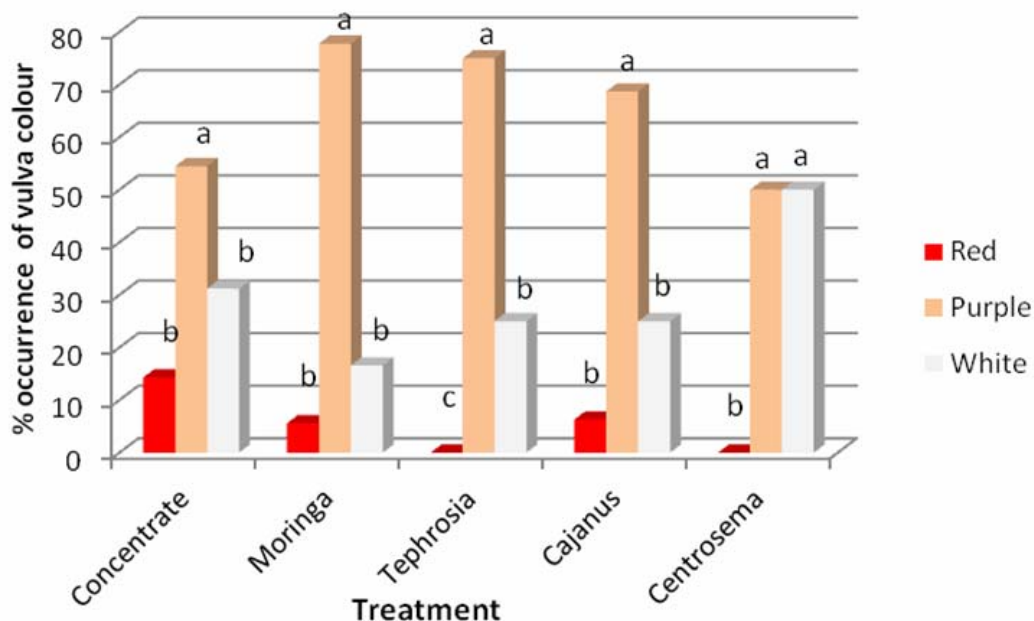


Figure 1: Frequency of vulva colors in the rabbit does fed the selected perennial forages
a, b, c indicates significant differences between bars within the same treatment ($P < 0.05$).

More rabbit does fed Moringa and Concentrate diets accepted mating faster compared to does fed Tephrosia, Cajanus or Centrosema (Figure 2 and Table 1). It may be argued that the better performance of Moringa fed does in mating acceptance is linked to the higher frequency of receptive does. Although twice matings occurred more frequently in all treatment groups (above 80 %, (Figure 3), however the percentage of does that accepted only one mating varied between the groups, from 0 % in Concentrate to 18.7 % in Cajanus groups.

The body weights and reproductive performances of does fed the different forages are shown in Table 2. Does fed Cajanus forage lost weight during the study. This is typified by the significant reduction in weight during the two weeks of experimental feeding prior to mating. Although *Cajanus cajan* seed is known to contain antinutritional factor and thus require heat processing before feeding to animals (D'Mello, 1995) no toxic components have been reported in the leaf, even though moderately unpalatable (Tropical forages, 2012). Udedibe and Igwe (1989) however reported reduced egg production in chicken fed cajanus leaf meal. Analysis of the overall conception rate (i.e fertility) of the two cycles showed that Cajanus fed does had significantly reduced fertility (60 %) compared to other groups (fertility >70%). Litter size at birth (born alive) was higher in the control group, intermediate for Moringa and Tephrosia and the lowest when fed Cajanus and Centrosema. Average kits weight at birth was lower in the Concentrate group as expected (litter size and kits weight are inversely related). Overall productivity (fertility x litter size) was significantly higher for the control group (4.8 born alive/mating), intermediate for does fed Moringa or Tephrosia (3.7 and 3.4 born alive/mating, respectively) and lower with the Cajanus or Centrosema diet (2.5 and 2.9, respectively). Our results of consistent better performance of the does fed Moringa forage are in agreement with those of Odeyinka et al. (2008) on the reproductive performance of rabbit does fed *Moringa oleifera* as a replacement for *Centrosema pubescence*. The performance of does fed Tephrosia forage was equally encouraging and suggest that this forage could serve as a better alternative to the conventional forages for rabbit feeding, especially during the dry season.

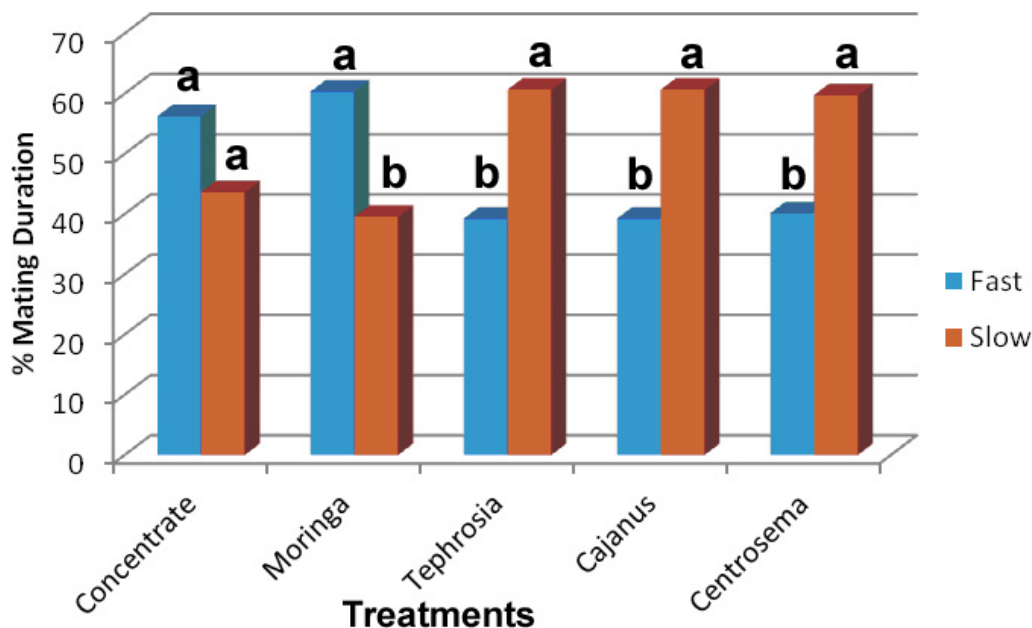


Figure 2: Mating duration in the rabbit does fed the selected perennial forages. a, b indicates significant differences between bars within the same treatment ($P < 0.05$).

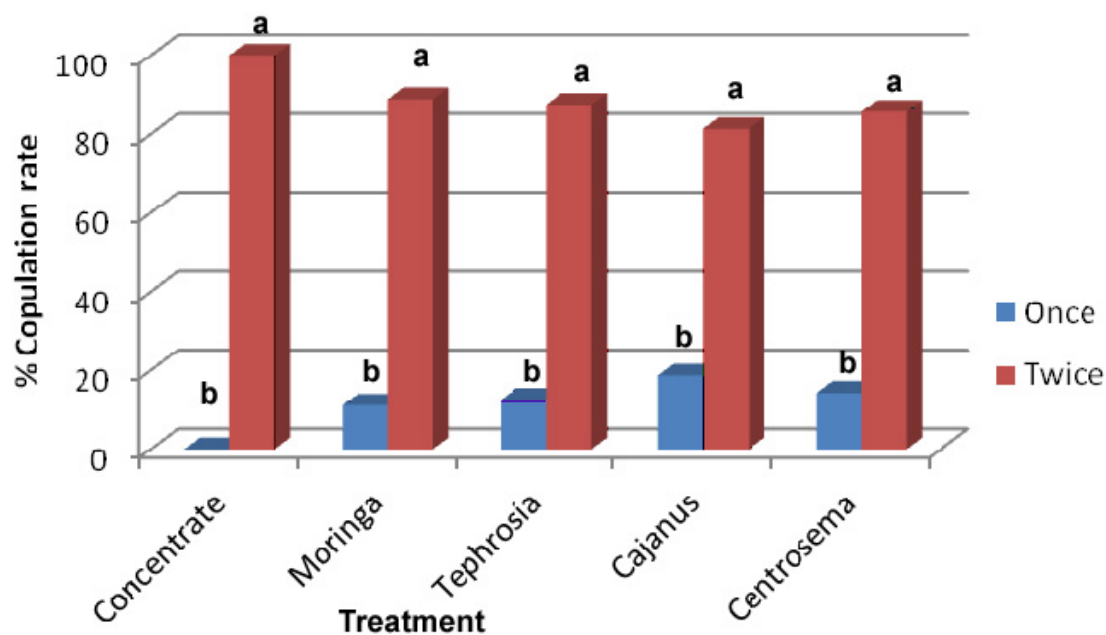


Figure 3: Copulation rate in the rabbit does fed the selected perennial forages. a, b see figure 2.

Table 1: Receptivity parameters in rabbit does fed selected perennial forages.

Receptivity parameters	Concentrate	Moringa	Tephrosia	Cajanus	Centrosema	Significance
Colored vulva (%)	68.8 ^a	83.4 ^a	75.0 ^a	75.0 ^a	50.0 ^b	0.05
Fast mating (%)	56.3 ^a	60.4 ^a	39.3 ^b	39.3 ^b	40.2 ^b	0.05
Double mating (%)	100.0	88.9	87.5	81.3	85.7	0.20

^{ab} Values within the same row with different superscripts are significantly different at $P < 0.05$.

Table 2: Body weights, conception rate and litter trait of rabbits does fed the selected perennial leguminous forages.

	Concentrate	Moringa	Tephrosia	Cajanus	Centrosema	SEM	P value
No of does	10	10	10	10	10		
Initial body weight (g)	1702	1703	1694	1697	1698	96	0.50
Weight at mating (g)	1869 ^a	1870 ^a	1778 ^a	1607 ^b	1811 ^a	83	0.03
<i>Conception rate (1st cycle):</i>							
1 st mating	80.0(10) ¹	70.0(10)	60.0(10)	60.0(10)	70.0(10)		
2 nd mating	50.0(2)	33.3(3)	100.0(4)	0.0(0)	33.3(3)		
Total	90.0	80.0	100.0	60.0	80.0		
<i>Conception rate (2nd cycle):</i>							
1 st mating	70.0(10)	70.0(10)	50.0(10)	50.0(10)	60.0(10)		
2 nd mating	66.7(3)	66.7(3)	40.0(5)	40.0(5)	50.0(4)		
Total	90.0	90.0	70.0	70.0	80.0		
Overall conception (%)	82.5 ^a (20)	77.5 ^a (20)	70.0 ^a (20)	60.0 ^b (20)	72.5 ^a (20)	8.50	0.05
Born alive	5.8 ^a	4.8 ^b	4.9 ^b	4.2 ^c	4.0 ^c	0.04	0.03
Kits weight at birth (g)	39.5 ^b	42.0 ^{ab}	48.8 ^a	44.8 ^{ab}	42.2 ^{ab}	0.25	0.02
Productivity index at birth	4.8 ^a	3.7 ^b	3.4 ^b	2.5 ^c	2.9 ^c	0.04	0.04

^{abc}Mean values within the same row with different superscripts are significantly different at P<0.05

¹ Values in bracket represent the number of does mated.

CONCLUSION

Does fed Moringa or Tephrosia diets performed well, close to does fed the concentrate diet, whereas does fed Cajanus diet showed reduced body weight, conception rate, litter size and overall productivity. Thus for dry season feeding of rabbit, under the Ile-Ife conditions, our study suggests that Moringa or Tephrosia forage supplemented with concentrate diet could be an acceptable option, but the results have to be confirmed using a larger number of does.

REFERENCES

- Babayemi O.J., Bamikole M.A., 2006. Effects of *Tephrosia candida* DC Leaf and its Mixtures with Guinea Grass on *in vitro* Fermentation Changes as Feed for Ruminants in Nigeria. *Pakistan J. Nutrition*, 5 (1), 14-18.
- D'Mello J.P.F., 1995. Antinutritional substances in legume seeds. In: D'Mello, D.P.F. and Devendra (Eds). *Tropical Legumes in Animal Nutrition*, CAB International, Wallingford, UK.
- Djakalia B., Guichard B.L., Soumaila D., 2011. Effect of *Moringa oleifera* on Growth Performance and Health Status of Young Post-Weaning Rabbits. *Research J. of Poultry Sci.*, 4, 7-13.
- Fuglie L.J., 2001. The multiple uses of Moringa. In: *The miracle tree, the multiple attributes of Moringa*, Fuglie, L.J. (Ed). CTA/CWS, Dakar, Senegal, pp 7-10.
- Makkar H.P.S., Becker K., 1996. Nutritional value and antinutritional components of whole and ethanol extracted *Moringa oleifera* leaves. *Anim. Feed Sci. Technol.*, 63: 211-228.
- Odedire J.A., Babayemi O.J., 2007. Preliminary study on *Tephrosia candida* as forage alternative to *Leucaena leucocephala* for ruminant nutrition in Southwest Nigeria. *Livestock Research for Rural Development* 19 (9).
- Odeyinka S.M., Oyedele O.J., Adeleke T.O., Odedire J.A., 2008. Reproductive performance of rabbits fed *Moringa Oleifera* as a replacement for *Centrosema pubescens*. In: *Proc. 9th World Rabbit Congress, 2008 July, Verona, Italy, Vol. A, 411-415*.
- Rodriguez J.M., Agrasal C., Esquifino A., 1989. Influence of sexual receptivity on LH, FSH and prolactin release after GnRH administration in female rabbits. *Anim. Reprod. Sci.*, 20, 57-65.
- Tropical forages, 2012. *Cajanus cajan*. http://www.tropicalforages.info/key/Forages/Media/Html/Cajanus_cajan.htm. consulted on 05/01/2012.
- Udedibe A.B.I., Igwe F.O., 1989. Dry matter yield and chemical composition of pigeon pea (*Cajanus cajan*) leaf meal and the nutritive value of pigeon pea leaf meal and grain meal for laying hens. *Anim. Feed Sci. Tech.*, 24, 111-119.