

COMPARATIVE ANALYSIS OF RABBITS' RESPONSES AND SEMEN QUALITY OF SEMEN COLLECTED USING A DEVELOPED DUMMY AND A CONVENTIONAL ARTIFICIAL VAGINA

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ABSTRACT

The use of artificial insemination for improving productivity in farm animals is undisputable. However, its success depends on the quality of semen collected which can be influenced by semen collection methods. This study compared the effects of two semen collection methods – a developed dummy and a conventional artificial vagina (AV) on rabbits' responses and semen quality. Twenty-four (24) sexually matured-male rabbits (bucks) and 2 sexually-matured female rabbits (does) were randomly assigned to two groups: dummy (n=12) and AV (n=12). Acceptability for dummy (14.30%) was lower than CAV (83.30%). Training period and reaction time was longer for dummy (28 days, 8.92 secs) than CAV (3 days, 3.02 secs). Results showed that colour, odour and viscosity were the same. There were similarities observed for concentration, individual motility, massal motility, volume and % live and dead were within acceptable range for rabbits. Percent abnormal and normal and pH for the CAV method was significantly ($P < 0.05$) different from the Dummy. These findings suggest that the developed dummy can serve as an alternative for semen collection in rabbits, offering similar semen quality and reduced stress for the animals.

Keywords: Artificial insemination, Dummy, Artificial vagina, Rabbits,

INTRODUCTION

Artificial insemination has successfully changed rabbit breeding programmes. According to Theau-Clement (2007), it was formerly used to obtain genetic improvement of the animals and to solve sanitary problems due to its numerous advantages. With advancement in the artificial insemination technology, it was later used to improve productivity and sustaining fertility even during unfavourable seasons of the year. Also, the use of the cyclic production system further improved farm organization, thereby, making health monitoring easier (Theau-Clement, 2007). However, the success of Artificial Insemination programmes relies heavily on the quality of semen collected, which according to Dalton (2011), is an important requirement for achieving adequate fertility in mammals. In recent years, alternative methods of semen collection have been developed, including the use of dummy devices (Munu *et al.*, 2024). These devices are designed to mimic the natural outlook of the female rabbit and also, it's reproductive tract, providing a more comfortable and stress-free experience for the donor males. This study aimed to investigate the effects of two semen collection methods - a developed dummy and a conventional artificial vagina (AV) on rabbit's response and semen quality. The findings of this study would provide valuable insights for optimizing AI programmes in rabbit breeding, and would contribute to the development of more efficient and humane methods of semen collection.

MATERIALS AND METHODS

Study site

The study was conducted at the Rabbit Unit of the University Teaching and Research Farm, University of Benin, Edo State, Nigeria. The Farm is situated on latitudes 6°24'11.4"N and longitudes 5°36'39.6"E (Google Maps, 2023).

Experimental Animals

A total number of 24 sexually matured-male rabbits (bucks) and 2 sexually-matured female rabbits (does) were obtained from a reputable farm for this study. The animals were kept in hutches and provided with feed (19% CP), forages and water without restriction for 6 weeks.

Experimental design

The experiment was laid out in a completely randomized design.

Dummy

The dummy structure was made with binding wires, stuffed with a thick foam for support and a flat foam to cover the wires before the skin was placed on top to reduce the hardness when mounted with height 10cm, girth circumference 29.5cm and position of AV 7.5cm in a slit behind all with a length of 25.5cm (Munu *et al.*, 2024) and fitted with a locally assembled AV as reported by Asibor *et al.* 2022)

Conventional AV

The conventional AV used in this study was made with materials that consisted of two pipes of varying lengths, a glass collection tube, and a latex liner. The conventional AV was purchased by the Department of Animal Science, University of Benin.

Data Collection and Semen Evaluation

Two semen collecting methods were compared for 4 weeks.

Data recorded in this study included Acceptability (sniffing, biting and playing around), Training period (time taken for animal to be trained to collect semen using that method), Buck reaction time recorded in seconds and frequency of collection

After each semen collection, semen samples were retrieved using a disposable pipette and semen volume was immediately read off in the graduated collection tube. Semen samples were visually checked for colour, dirt and urine contamination. Further analyses done in the laboratory included sperm motility under the light microscope at $\times 400$, percent live and dead and percent normal and abnormal spermatozoa after eosin-nigrosin staining and sperm concentration using the Neubauer improved haemocytometer.

RESULTS AND DISCUSSION

Acceptability recorded was 14.30% for the dummy and 83.30% for the CAV, training period was an average of 28 days for dummy and 3 days for CAV, buck reaction time was longer for dummy at 8.92 secs which is longer than the reaction time recorded by Ogbewu *et al.* (2009) with a record of 4.02 secs and higher than that recorded for the CAV at 3.02 secs. The frequency of collection for the CAV was 95% and dummy was 80%. The results of bucks' semen collected with the CAV and Dummy are presented in Tables 2. The parameters such as colour, odour and viscosity showed similarities in the collection methods used. The colour of the semen samples from each of the collection methods was same milky white. This corroborates the findings of Alvarez *et al.* (2006) who reported that normal and good quality semen is milky white in colour and it is also the predominant and best in rabbits. The odour was normal for rabbit semen and they all had normal viscosity. The quality of semen collected with CAV and Dummy as presented in Table 3 shows no significant ($P > 0.05$) differences in the concentration, individual motility, massal motility, volume, % live and dead and were within acceptable range for rabbits. (Compos *et al.*, 2004; WHO 2010). However, pH, reaction time and percent abnormal had significant ($P < 0.05$) differences among the different collection methods. Percent abnormal and normal and pH for the CAV method was significantly ($P < 0.05$) different from the Dummy. It was observed that the pH values were lower than the normal range referenced by WHO (2010) ranging from 7.2- 8.0.

Table:1 Rabbits' responses to CAV and Dummy

Parameters	CAV	Dummy
Acceptability (%)	14.30	83.30
Training period (days)	3	28
Buck reaction time (secs)	3.02	8.92
Frequency of collection (%)	95	80

Table 2: Quality of Semen Collected with Conventional AV and Dummy

Parameters	Conventional AV	Dummy	SEM
Colour	Milky white	Milky white	
Odour	Fresh milk smell	Fresh milk smell	
Viscosity	Normal	Normal	
Volume(mL)	0.49 ^b	0.40 ^a	0.14
pH	6.68 ^b	7.03 ^a	0.10
Concentration (x 10 ⁶ cells/mL)	116.2 ^a	117.2 ^a	1.83
Individual motility	60.25 ^a	61.25 ^a	3.94
Massal motility	Moderate	Moderate	
%Live	75.83 ^a	71.89 ^a	4.22
%Dead	24.17 ^a	28.11 ^a	6.21
%Normal	81.49 ^a	65.46 ^b	4.46
%Abnormal	18.51 ^b	34.54 ^a	4.43
Interval btw collection and analysis(mins)	30.00	30.00	

Means with same letters within the same column are not statistically different ($p > 0.05$).

CONCLUSION

This study showed that rabbits responses to the conventional AV was quicker compared with the Dummy, however with training the dummy can also be used for semen collection providing a less stressful experience. Semen quality was similar for both devices used in this study and results obtained were within acceptable range. And as such the dummy can provide easier way for semen collection in rabbits. It is recommended that fertility evaluation should be carried out with rabbit semen collected using the dummy collection devices.

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