

## Effects of preservation time and method on semen quality of local and exotic cocks

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### ABSTRACT

The study was aimed at assessing the effects of time (30 minutes and 1 hour after semen collection) and method of preservation (room temperature and refrigeration) on semen quality of local and exotic cocks. Semen samples were collected from Harco, Isa Brown, Frizzled feathered, Normal feathered and Naked necked cocks. Semen quality parameters measured were statistically analysed. Significant ( $p < 0.05$ ) breed effect on viability due to preservation was observed. The results revealed that spermatozoa of Isa brown and Frizzled feathered cocks were 100% active after 30 minutes of storage at room temperature. However, semen from Harco cocks was 86.67% active, 6.67% sluggish and 6.67% dead. Normal feathered had 20% active, 20% sluggish and 60% dead cells while Naked neck had 33.33% active, 16.67% sluggish and 50% dead cells after 30 minutes at room temperature. The result of the viability of sperm cells after 1 hour at room temperature revealed that only Harco, Normal feathered and Naked neck cocks had surviving sperm cells. Harco had 20% active, 6.67% sluggish and 73.33% dead while Normal feathered had 10% active, 10% sluggish and 80% dead sperm cells and Naked neck had 13.33% active, 21.67% sluggish and 65% dead sperm cells. This implies that semen will be better preserved at room temperature than when stored in the refrigerator at  $-4^{\circ}\text{C}$  except when extenders/cryoprotectants are used to prevent cool shock that could have killed the cell as noticed in the present study. In conclusion, semen from cocks must be used immediately for insemination after collection to maximize fertility of eggs.

**Keywords:** Semen, preservation, local, exotic, cocks

### INTRODUCTION

Poultry production constitutes an important component of the agricultural economy in developing countries and in Nigeria in particular. Poultry farming has become especially popular due to the quick cash returns, low capital input and subsequent poverty alleviation in the rural and even in the urban communities (Adesope, 2006). Profitable poultry farming depends on quality chicks, feed and good management. In the quest for producing enough meat and egg for the increasing demand of

consumers, healthy broiler chicks and layers must be produced. As such, many commercial farmers rear their own parent stock and introduce the use of artificial insemination (AI) in order to reduce management cost. The assessment of semen quality characteristics of poultry birds is an excellent indicator of their reproductive potential and has been reported to be a major determinant of fertility and subsequent hatchability of eggs (Peters *et al.*, 2004). Artificial insemination is a means of conservation of

germplasm. Conservation of germplasm from domestic and endangered species via sperm cryopreservation has been practiced for decades (Gill and Barbato, 2001). Chickens were the first animal to be produced from sperm using glycerol as cryoprotectant (Donoghue and Wishart, 2000) but since then there has not been considerable progress in the development of semen cryopreservation technology in the poultry industry especially in Nigeria. The cock ejaculate is generally small in volume, but highly concentrated hence there is a potential of its extension with the help of relevant diluents. It is known that sperm mortality and the fertility ability of the undiluted chicken semen stored *in-vitro* decreased within one hour of collection (Carter *et al.*, 1957). This implies that in storing semen of fowl, the type of diluents and storage temperature are very important factors to consider in order to avoid a reduction in sperm quality. In Nigeria, a few poultry farms especially parent stock farms use AI technique to maximize their production. However, many of these farms do not use diluents or extenders. This research was designed to assess the viability of poultry semen stored at room temperature and at refrigeration temperature ( $-4^{\circ}\text{C}$ ) for a period of time.

## MATERIALS AND METHODS

The experiment was carried out at the Poultry unit of the Faculty of Agriculture, University of Port Harcourt demonstration farm in Choba, Port Harcourt. This location lies between latitude  $40^{\circ} 31'$  and  $50^{\circ} 0' \text{N}$  and longitude  $60^{\circ} 45'$  and  $70^{\circ} 30' \text{E}$  in South-South Nigeria. Cocks of the local breeds (Naked neck, Frizzled feathered and the Normal feathered) and exotic breeds (Harco and Isa brown) were used as semen donors for this study. Two (2) sexually active cocks of about eight to nine months of age of each breed were used. The birds were kept and maintained in an intensive deep litter system and were given a period of one week to adapt to their new environment before collection of semen

commenced. Prior to semen collection, the feathers growing around the abdominal region of the birds were shaved so as to create room for semen collection. Then, the birds were allowed to undergo training by abdominal massage (Burrow and Quins, 1937). This was to enable the birds become familiar with the massage techniques, create ease for stimulation and release of semen and to be familiar with the semen collector. Semen was collected from each bird using a 2ml microcentrifuge tube using the abdominal massage technique (Burrow and Quins, 1937). Each sample was collected fresh, divided and preserved in two forms. The first was stored in a refrigerator at a temperature of  $-4^{\circ}\text{C}$ . Semen viability was assessed every 30 minutes until no motile sperm cell was observed. The second samples were kept at room temperature and also analysed every 30 minutes until no motile sperm cell was observed. All experimental data were subjected to analysis of variance (ANOVA) using SAS (2010). Significant means were separated using the Duncan Multiple Range Test.

## RESULTS

Tables 1, 2 and Figure 2 show the effects of breed, storage time and method of preservation on semen quality. The effect of breed on the viability of preserved semen was observed in this study. The results on Table 1 and Figure 1 revealed that semen of Isa brown and Frizzled feathered cocks were 100% active after 30 minutes of storage at room temperature. However, semen from Harco cocks was 86.67% active, 6.67% sluggish and 6.67% dead. Most of the sperm cells from Normal feathered and Naked neck cocks died after 30 minutes at room temperature. Normal feathered had 20% active, 20% sluggish and 60% dead cells while Naked neck had 33.33% active, 16.67% sluggish and 50% dead cells after 30 minutes at room temperature. The result for refrigeration temperature after 30 minutes was the same for all breeds. They all died. The result of

the viability of sperm cells after 1 hour at room temperature is also shown in Figure 1. Only Harco, Normal feathered and

Naked neck cocks had surviving sperm cells.

**Table 1: Breed effect on semen quality**

	Active	Sluggish	Dead cell
Harco	26.66±10.73	3.33±1.04 <sup>bc</sup>	3.33±1.04 <sup>bc</sup>
Isa brown	25.00±13.05	0.00±0.00 <sup>c</sup>	0.00±0.00 <sup>c</sup>
Frizzled feather	25.00±13.05	0.00±0.00 <sup>c</sup>	0.00±0.00 <sup>c</sup>
Normal feather	7.50±2.50	7.59±2.53 <sup>ab</sup>	17.00±7.55 <sup>ab</sup>
Naked neck	11.66±4.13	9.58±2.95 <sup>a</sup>	28.75±8.82 <sup>a</sup>

*a, b, c: Means with different superscript in the same column are significantly ( $p < 0.05$ ) different. Values are means  $\pm$  std. error*

Harco had 20% active, 6.67% sluggish and 73.33% dead while Normal feathered had 10% active, 10% sluggish and 80% dead sperm cells and Naked neck had 13.33% active, 21.67% sluggish and 65% dead sperm cells. The effect of breed on semen quality is shown in Table 1. There was no significant ( $p < 0.05$ ) difference in the percentage of active cells. However, Breed effect was observed for sluggish and amount of dead cells. Naked neck had the highest number of sluggish cells (9.58±2.95). This was followed by Normal feather (7.59±2.53) and then Harco (3.33±1.04). There were no sluggish cells for Isa brown and Frizzled feathered

chickens. This same trend was observed with the percentage of dead cells with the highest value seen in Naked neck (28.75±8.82) and the least in Harco (3.33±1.04). Table 2 shows the effect of preservation time on semen quality. A significant ( $p < 0.05$ ) effect of preservation time was observed for active, sluggish and dead cells. The highest number of active cells was observed under room temperature at 30 minutes (68.00±9.19). This was followed by room temperature at 1 hour (8.66±2.08). This same trend was observed for percentage of sluggish and dead cell.

**Table 2: Preservation time and semen quality**

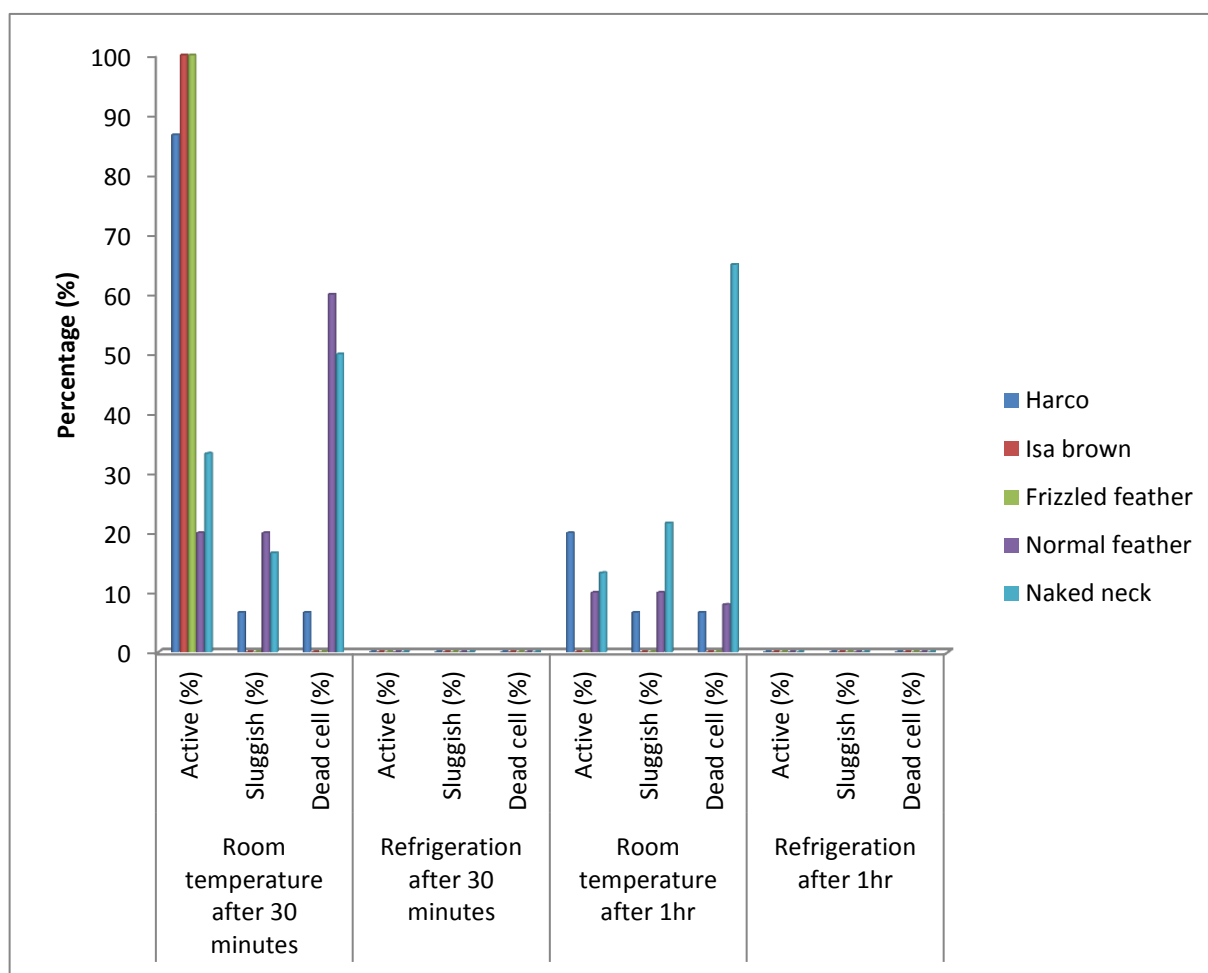
	Active	Sluggish	Dead cell
Room temperature after 30min	68.00±9.19 <sup>a</sup>	8.66±2.25 <sup>a</sup>	23.33±6.99 <sup>a</sup>
Refrigerated temperature after 30min	0.00±0.00 <sup>b</sup>	0.00±0.00 <sup>b</sup>	0.00±0.00 <sup>b</sup>
Room temperature after 1hr	8.66±2.08 <sup>b</sup>	7.74±2.16 <sup>a</sup>	15.93±6.62 <sup>a</sup>
Refrigerated temperature after 1hr	0.00±0.00 <sup>b</sup>	0.00±0.00 <sup>b</sup>	0.00±0.00 <sup>b</sup>

*a, b, c: Means with different superscript in the same column are significantly ( $p < 0.05$ ) different. Values are mean  $\pm$  std error*

The highest number of sluggish cells was observed under room temperature at 30 minutes (8.66±2.25). This was followed by room temperature at 1 hour (7.74±2.16).

Also, the highest number of sluggish cells was observed under room temperature at 30 minutes (23.33±6.99). This was

followed by room temperature at 1 hour (15.93±6.62).



**Figure 1: Effects of breed, storage time and method of preservation on semen quality of local and exotic cock semen**

## DISCUSSION

These results are similar to those of Sasanami (2013) who reported that sperm cells can survive at temperature close to temperature of the hen which is 41°C. However, the death of all sperm cells at refrigerator temperature of - 4°C supports the report of Thurston (1995) who reported that semen preservation is always accompanied by deterioration in spermatozoa quality and fertility.

The death of the sperm cells under refrigeration could be due to the lack of diluents and cryoprotectants. Dumpala *et al.* (2006) explained that the diluents used for semen extension and storage conditions such as time, aeration, and holding temperature play a major role in

maintaining the quality of semen over storage. However, Slanina *et al.* (2011) reported that use of the low temperature (4 - 8°C) for long-term storage of turkey spermatozoa could maintain better motility than higher storage temperature. The decrease in the number of sperm cells viable over time as seen in this study is supported by Carter *et al.* (1957) who observed that sperm motility and the fertilizing ability of undiluted neat fowl semen stored in vitro usually decreased within 1 hour of collection. Watson and Morris (1987) also observed that exposing sperm to subphysiological temperatures, especially in the range of 0 to 20°C may cause damage, or “chilling injury”.

## CONCLUSIONS

This study revealed that storage temperature plays a vital role in the preservation of chicken semen. Preserving semen at refrigerated temperature even for a short period of time without using diluents and cryoprotectants will lead to a higher rate of deterioration of the sperm cells than when preserved at room temperature. This is because room temperature is closer to the body temperature of cocks. Farmers who use AI in their farms are advised to use the semen immediately after collection or keep their semen in vials inside containers with lukewarm water (37 - 41°C) to mimic the body temperature of the chicken or at room temperature to maximize fertility. However, for better efficiency, the use of diluents and extenders should be employed if insemination will not be done immediately after semen collection.

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