INFLUENCE OF BREEDS AND TIME OF COLLECTION ON SEMEN CHARACTERISTICS IN LOCAL AND EXOTIC CHICKEN COCKS REARED UNDER A CONTROLLED ENVIRONMENT IN EDO STATE, NIGERIA

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Abstract
An experiment was conducted with 80 breeds of mature chicken cocks, 32 weeks of age and comprising of 60 local cocks (Naked Neck, Frizzle Bird and Normal Feather Bird) and 20 exotic cocks (Dominant Black). The cocks were managed in battery cage system for individual identification. Feeds and water was given ad-libitum. The cocks were ejaculated using the massage techniques. Samples of semen were collected and analyzed to know the influence of time of semen collection on the different strain (breed) of local and exotic cocks using the following parameters: semen volume, semen pH, sperm concentration, sperm motility, percentage live spermatozoa and percentage sperm cell abnormality. Results showed that all the parameters assessed were influenced by the breeds of cock, with significantly ($p<0.05$) differences observed in all parameter with the exception of sperm pH that shows no significant ($P0>0.05$) differences in both the local and the exotic cocks. On the other hand time of semen collection shows that morning (AM) collection was significantly ($p<0.05$) higher than even collection (PM) in terms of semen volume, concentration, motility%, live spermatozoa% and sperm abnormality%. From the result, it was concluded that the semen of the local strain of cocks is not inferior to the exotic breed but semen for artificial insemination is better collected in the morning.

Keywords: Breeds influence, time of collection, semen characteristic of cock.

Introduction

The indiscriminate use of cocks of different breeds/strains and the effect of ageing on the potency of semen production may have high set back on the future of poultry production and artificial insemination (AI) in the Nigeria poultry industries. With ageing, cock or any other male farm animals are subjected to life time hazards including various infections, nutritive problem and trauma which tend to affect the fertility of such animals (Graham, *et al.*, 1993).

In cocks, spermatozoa production immediately after puberty is of low quality but there is significant improvement within a few months with the rate of transition from poor to good semen being dependent on breed (Garner *et al.*, 1996). They also reported that there was no significant change in sperm concentration, sperm number per ejaculate and sperm motility for young and matured cocks with the exception of ejaculate volume and that ageing is significantly correlated with ejaculate volume but not with total number of spermatozoa per ejaculate.

One of the ways to enhance the commercial values of the local chickens is to improve their fertility and breeding performance. Horst (1988) identified nine major genes of the indigenous chicken that can be used in Genetic Improvement Programs (GIP). Among these includes the Naked Neck (NK), Frizzle (F), Normal (N), Deep Blue (DB), Deep Black (DBK) genes, which abound in our local chicken populations. Birds which possess these genes need to be exploited for the development of viable indigenous poultry industries in Nigeria (Horst, 1988).

Unfortunately the naked neck (NK) and the frizzles (F) genotypes have been grossly neglected probably as a result of their phenotypic appearance, which make them unattractive, however available evidence (Merat, 1986) has shown that some of these local birds maintain their reproductive potential even at high ambient temperature of 30^{oC} and above, when compared with the normal feather birds.

The time of semen collection could be influenced by temperature fluctuation during the period of collection. Rathore (1970) reported that cocks and Rams, developed a variety of severe sperm cell deformities when exposed to high temperature but return to normal within 33 days post heating. In cocks, an increase in sperm abnormalities have been correlated with lowered fertility (Osinowo *et al.*, 1988), heat stress (Braden and Mattner, 1975) and testicular pathology (Anosa and Isoun, 1980).

The routine evaluation of the fertility of most cocks could be determined either under farm conditions by obtaining either viability through natural mating or by a variety of *in vitro* procedures such as in AI and through the assessment of their testes and semen. Assessment of their testes has been shown as a valuable predictor of male fertilizing ability (Gabor *et al.*, 1995). However, examination of the

testes alone cannot give an accurate assessment of the male fertility. It has to be combined with the examination of the semen characteristics for effective prediction of fertility (Barth, 1992). The aim of this research work therefore is to assess influence of breeds/strain and time of semen collection on semen characteristic of both local and exotic cock in an on station farm situation.

Materials and Methods

Experimental Site: The research was carried out at the poultry unit of the teaching and research livestock farm of the Ambrose Alli University Ekpoma, Edo State. Ekpoma, lies between 6.44 N and 6.8 E, in Esan West Local Government Area of Edo State, Nigeria. The area lies in the south-south geo-political zone of Nigeria and a prevailing tropical climate with an annual mean rainfall of about 1556 mm. The mean ambient temperature ranges from 26°C in December to 34oC in February, relative humidity ranges from 61% in January to 92% in August with yearly average of about 82%. The vegetation represent an inter face between the tropical rain forest and the derived savanna.

Experimental Animal and Management of Stock: A total of 80 breeds comprising of 60 local cocks and 20 exotic cocks were used for this research. They consist of four strains, that is, normal feather, frizzle feather and naked neck breeds, being the local breeds, while the dominant black serves as the exotic strain. The birds were managed under an intensive system (battery cage system) where they were intensively raised before they became matured for semen collection. Semen was collected from the cocks before feeding them each day of semen collection in the morning, serving as AM collection and between 4 and 5 pm in the evening, serving as PM collection.

Semen Collection: The cocks were given preliminary training for two weeks to enable them produce enough semen during actual semen collection exercise. The back-lumbar massage method as described by Lake *et al.* (1985) was adopted. All ejaculates were collected in a graduated test tube and were immediately placed in a flask with an insulated jacket containing warm water (37-40°C) with which it was taken to the laboratory for analysis. In the AI laboratory, the semen samples were analyzed for the following sperm parameters: Semen volume, Concentration, PH, % Mortality, Live Spermatozoa % and Abnormality % as enumerated by Nwachukwu *et al.* (2006). Data collected were subjected to analysis of variance to investigate the effect of time of collection on quantity and quality of different breed of local and exotic cocks.

Results and Discussion

Result from this study, as shown in Table 1 reveal that breed and time of semen collection significantly influence the semen characteristic of cocks. Parameters such as semen volume, concentration, percentage live spermatozoa and sperm abnormality were significantly ($P<0.05$) influenced by time of collection, result shows that the mean volume of semen collected in the morning time (AM) was 0.49± 0.04 compared with the value of 0.39±0.03 collected in the evening time (PM) which was significantly lowered. Similarly the mean value of 86.44±2.35 for percentage live spermatozoa was significantly higher than the value of 81.23±1.59 for PM collection. Furthermore the value of 10.53±0.70 for PM value for percentage sperm abnormalities was significantly ($P<0.05$) higher than the value of 8.43±0.35 obtained in the AM. Time of collection did influence sperm PH and Motility in this study.

This finding agrees with the findings of Garner *et al,* (1996) and Okukpe, *et al,* (2001) when they reported that ejaculate volume can be affected by time of collection and age of the cocks. They also reported that sperm concentration, motility and cell per ejaculate were not affected by age of cock. The superior values of the AM semen collection as observed in this study can be easily attributed to a number of environmental factors, since increased environmental temperature during the PM period usually cause thermal stress in animal (Okukpe, *et al,* 2001). Other researchers has also shown that increased ambient temperature decrease sperm production and modifies the characteristics of sperm (Lincoln and Short, 1980; Colas, 1983).

When the semen characteristic was evaluated against the background of breeds influence on semen volume, concentration, PH, Mortality, percentage live spermatozoa and sperm abnormality, it was observed the breeds of cocks significantly ($P<0.05$) influence some of this parameters within breeds and between breeds. For example semen volume was highest in the Normal feather cocks (0.58±0.07) in the AM time and highest in the Frizzle feather cocks (0.46±0.01) in the PM period. This goes to show that some breeds of cocks has better resistance to the environmental temperature or thermal stress which has been attributed to the major cause of variation in semen characteristic (Wettemann, *et al.,* 1978) . With the exception of semen PH value which did not show any significant difference within and between breeds of cocks, other parameters such has sperm

motility, concentration, percentage live sperm and sperm abnormality were significantly influences by the breeds of cocks when values where compared statistically between breeds and within breeds.

Conclusion

It has been shown in this study that the time of semen collection significantly affect most of the semen characteristics such as semen volume, semen concentration, percentage live spermatozoa and sperm abnormality, semen collected in the morning (AM) were significantly ($p<0.05$) superior than semen collected in the evening (PM) in all the strains or breeds of local and exotic cocks. The time of collection effect could have been due to changes in sperm metabolism during that hotter part of the day when the ejaculate was collected. It is concluded that semen quality of both local and exotic strain of cocks could be adversely affected by the prevailing hot environmental day temperature as they did to all cocks under investigation. Thus, we are recommending that there is the need to exploit the genetic reserve of our local cocks in the development of strains of birds that will be better adapted to our local environment, since their semen is not inferior to the exotic strain. Finally semen collection should be done in the morning for use in commercial poultry artificial insemination (AI) program.

References

Anosa, V.O. and Isoun, T.T. (1980). Further observations on the testicular pathology in trypanosoma vivax infection of sheep and goats. ***Res. Vet. Sci.*** 28:151-160.

Barden A W H and Mattner R E (1975). The effects of scrotal heating in the ram on semen characteristics, fecundity and embryonic mortality. *Aust. J. Agric. Res.* 21: 509-515.

Barth, A.D. (1992). The relationship between sperm abnormalities and fertility. Proc. 14th Tech. Conf. Artif. Insem. Reprod. Nat. Assoc. Anim. Breeders. 47-63.

Colas G (1983). *Factors affecting the quality of semen: in animal production,* W, Haresign ed. Butterworth's pub, pp. 544-460.

Gabor, G.; Mezes, M.; Tozser, J.; Bozo, S.; Szucs, E.; Barany, I. (1995). Relationship among stestosterone response to GnRH administration, testes size and sperm parameters in Holstein - Friesian bulls. *Theriogenology* 43:1317-1324.

Garner, D.L., Johnson, L.A., Allen, C.H., Palencia, D.D. and Charmbers, C.S. (1996). Comparism of Seminal quality in Holstein Bulls as yearlings and as mature sires. *Theriogenology* 45: 923-934.

Graham, J., Alexander, A., Hammerstedtt, R. II. and Barbafo, G. F. (1993). Effect of genotype and cryopreservation of a semen on fertility and number of pre-villtline Spermatozoa", *British poultry Sci.* 34(94): 757-564.

Horst, P. (1988). Native fowl as reservoir for genomes and major genes with direct and indirect effect on production adaptability", In Proc. 18th world Poultry Congress, Nagoya, Japan, Sept. 9, 1988, p. 105. 16. IBE S N (1990), "Utilizing local poultry. Proc, 4th world Congress on genetics", *Applied to livestock production.*

Lake, P. E., Ravie, O. and Naddington, D. (1985). Some effect of the composition of inseminated semen and the site of its deposition and fertility in *Gallus domesticus*. *Annual Reprod. Sci.* 9:273-284.

Lincoln, G.A. and Short, R.V. (1980). Seasonal breeding: nature's contraceptive. *Rec. Prog. Horm. Res.* 36:1

Merat, P. (1986). Genes in poultry production. *World poultry Science Journal* . 42 (2): 124-142.

Nwachukwu, E.N., Ibe, S.N. and Amadi, C.U. (2006). Effect of genotype and frequency of semen collection on semen characteristic of local chicken cocks. Journal of Animal and Vet. Advances, vol. 5(7): 562-565.

Okukpe, K.M., Adeloye, A.A., Adeyemi, K.D., Olatunde, O.A., Ojo, V. and Sola-Ojo, F.E. (2012) . Effects of Extender Types on Ram Semen Collected With Electroejaculator in Tropical Environment. *Asian J. Anim. Sci.* 1:1-7

Osinowo, O.A.; Ahmed, M.S. and Ekpe, G.A. (1988): Semen quality and sperm output of Yankasa rams at different ages. *Theriogenology* 9:381-386.

Rathore, A. K. (1970): Acrosomal abnormalty in Rams Spermatozoa due to Heat stres. *Br. Vet, J.* 126:440-443.

Wettemann, R.P. Wells, M.E.; Omtved, I.T., Pope, G.E. and Turman, E.J. (1978): Influence of elevated ambient temperature on reproductive performance of boars . *J. Anim. Sci.* 42.664

Table 1: Effect of Time of Semen Collection on Sperm Characteristic of Different Breeds of Cocks

		BREEDS OF BIRD				
SEMEN CHARACTERISTIC	PERIOD OF COLLECTION	NNF	FF	NF	DBF	MEAN ±SEM
Volume	AM	0.36±0.03^{a} (x)	0.56±0.03^{a} (y)	0.58±0.07^{a} (y)	0.46±0.03^{a} (y)	0.49±0.04*
	PM	0.36±0.01^{a} (x)	0.46±0.01^{b} (y)	0.39±0.04^{b} (x)	0.35±0.02^{b} (x)	0.39±0.02
Concentration	AM	18.45±0.25^{a} (x)	20.76±0.56^{a} (y)	21.75±0.75^{a} (y)	20.40±0.50^{a} (y)	20.34±0.52*
	PM	17.56±0.16^{a} (x)	18.43±0.25^{b} (y)	19.56±0.25^{b} (z)	18.95±0.25^{b} (y)	18.63±0.23
PH	AM	7.75±0.24^{a} (x)	7.85±0.24^{a} (x)	8.00±0.15^{a} (x)	7.85±0.56^{a} (x)	7.86±0.30
	PM	7.54±0.15^{a} (x)	7.54±0.45^{a} (x)	7.45±0.32^{b} (x)	7.40±0.21^{a} (x)	7.51±0.28
Motility %	AM	80.20±0.54^{a} (y)	66.62±0.75^{a} (x)	86.62±0.75^{a} (z)	86.40±0.75^{a} (z)	79.96±0.75
	PM		65.62±1.75^{a} (x)	85.62±2.75^{a} (z)	85.62±2.75^{a} (z)	79.25±2.75
		80.15±50^{a} (y)				
Live Spermatozoa %	AM	85.15±2.45^{a} (y)	87.50±1.90^{a} (y)	85.58±2.50^{a} (y)	87.52±2.55^{a} (y)	86.44±2.35*
	PM		85.35±1.35^{b} (z)	79.40±2.45^{b} (x)	81.59±0.95^{b} (y)	81.23±1.59
		78.57±1.60^{b} (x)				
Sperm Abnormality %	AM	7.33±0.15^{b} (x)	10.50±0.55^{b} (y)	7.42±0.30^{b} (x)	8.48±0.40^{a} (x)	8.43±0.35
	PM	10.45±0.54^{a} (x)	12.50±0.45^{a} (y)	9.50±0.54^{a} (x)	9.65±1.25^{a} (x)	10.53±0.70*

Key : Subscripts x,y,z in parenthesis within the same row differs significantly ($P<0.05$)
While superscripts a,b along the same column differs significantly ($P<0.05$) .
Note: ± standard errors of means. * Significantly different ($P<0.05$) along the same column
NNF: Naked Neck Feather, FF: Frizzle Feather, NF: Normal Feather DBK: Dominant Black Feather (exotic breed)