

SEMEN CHARACTERISTICS AND FERTILITY OF THREE STRAINS OF NOILER COCKS

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ABSTRACT

A study was carried out to determine the semen characteristics and fertility of three strains of noiler cocks. A total 180 normal feathered Noiler birds were procured at nine weeks of age from Bauchi state Agricultural Development Program (BSADP) farm comprising of 45 Noiler cocks (15 brown, 15 black and 15 spotted) and 135 Noiler hens (45 brown, 45 black and 45 spotted). The experiment lasted a period of eight months and they were fed commercial diet throughout the period of the experiment. Two types of incubator were used, namely automatic incubator (A) and locally built water bed (B). The study was conducted at the poultry unit of the BSADP. The result showed that in parameters such as semen colour, pH, total motility, dead sperm, abnormal sperm cells and sperm concentration ($\times 10^9$) there were no significant difference ($p < 0.05$) between the strains however volume, mass activity and sperm concentration were significantly different ($P < 0.05$). Statistical difference ($P < 0.05$) were observed from incubator A, where brown strain showed high fertility, followed by spotted and least in black with 83.7%, 80.8% and 75.3% respectively. From incubator B, it shows significant difference ($P < 0.05$) with black strain showing highest fertility percentage (86.3%) followed by spotted (78.1%) and least were observed in brown with 72.6%. Chick quality with regards to weight is statistically not different ($P < 0.05$) among strains. The data obtained from this study indicate that there were variations among the stains in parameters such as semen volume, mass activity and semen concentration. However these variations did not influence the quality of day old chicks as no statistical difference was observed. This study there for recommends that any of the three strains of Noiler cocks can be used for breeding purposes.

Keywords: Noiler, Semen, Strain, Cocks, Characteristics

INTRODUCTION

The demand for animal protein has globally increased, in the last five years meat consumption has gone up satisfactorily. The recent ban on the importation of poultry and their products has constituted a major challenge to the indigenous poultry industry to meet up the immediate and future protein needs of the country. This challenge calls for improvement and/or change in the traditional production system and optimization of poultry reproductive traits such as fertility, hatchability and chick quality. With Noiler chicken breed, the production of animal protein is cheaper and sustainable. The Noiler chicken is a dual purpose breed of chicken developed in Nigeria, Noiler s are suitable for rural communities and small holder farmers (justagric.com, 2019). Reproductive performance is usually expressed in terms of egg production in the hen and seamen yield and quality in cocks. Assisted reproduction technologies (ART's), such as artificial insemination (AI) contribute to increased poultry production, as it allows a wider use of genetically superior cockerels. In a breeder flock, fertility rates are often related to the male performance Surai and Fisin (2012) stated that chick viability is important in the profitability of the poultry industry. In contrast to mammals, chicken embryonic development takes place in a semi-closed environment, the egg, with only exchange of gas and water with the outside. However, information about Noiler chicken's fertility, hatchability and chick quality is not fully understood. This research was designed to determine the semen characteristics and fertility of three strains of Noiler cocks.

MATERIALS AND METHODS

The study was conducted at the poultry unit of the Bauchi State Agricultural Development Project (BSADP) Bauchi State, Nigeria. It lies between latitude 9.30° and 12.3° north of the equator, and Latitude 8.48° and 11° East of the Greenwich meridian. A total 180 normal feathered Noiler birds were procured at nine weeks of age from Bauchi state Agricultural Development Program (BSADP) farm comprising of 45 Noiler cocks (15 brown, 15 black and 15 spotted) and 135 Noiler hens (45 brown, 45 black and 45 spotted). The experiment lasted a period of eight months and they were fed commercial diet throughout the period of the experiment. Two type of incubator were used, namely automatic incubator (A) and locally built water bed (B).

Semen collection

Semen samples were collected weekly by abdominal massage technique (Donoghue and Wishart, 2000). After restraint, the back of the cock was gently stroked from behind the wings but firm and rapidly toward the tail. The cock responded with tumescence erection of the phallus, and the handler then gently squeezed the cloaca expressing semen through the external papillae of the ducti deferentis and collected semen into clean 1 ml Eppendorf tubes. The tubes were then held at a suitable temperature for analysis.

Semen analysis

Semen volume-this was obtained as the difference between weight of tube and sample. Semen colour-this was visually assessed immediately after collection and scored as; 1=creamy, 2=creamy-white and 3=opaque (Peters et al., 2008).

Semen pH- a drop of semen was evenly placed onto a pH paper, after the colour of the impregnated zone became uniform (<30 seconds) it was compared with the calibrated strip to read the pH. Mass activity (gross motility) - was determined by placing a drop of raw undiluted semen on a pre-warmed slide and covered with a slip to spread it into a uniform thickness and to prevent drying up, it was viewed under a microscope at 100x and motility estimated by subjectively assessing the wave patterns and ranked as follows, 4 – rapid swirling, 3- slower swirling, 2 – generalized oscillation and 1 – sporadic oscillation.

Individual sperm motility-examined at 400x magnification several fields were examined and estimated to the nearest 10% subjective assessment was carried out and expressed as percentage of motile sperm with moderate to rapid progressive movement.

Percentage live dead and normal/abnormal spermatozoa were evaluated using the eosin nigrosine staining procedure. One drop of the stain was taken using a pipette and placed at the end of a warm slide and mixed with one drop of semen. After making the smear the slide was allowed to dry, and then examined using a light microscope at a magnification power of 400x, the live spermatozoa were identified as bright and not stained. Their outlines were clearly defined and their heads were bright and retractile against the backgrounds. The dead spermatozoa stained pink and outlines were not clearly defined. The percentage of live and dead spermatozoa was calculated from 200 spermatozoa which were counted in each slide from different microscope fields. The morphologically abnormal spermatozoa were also estimated on the same smears by counting 200 spermatozoa in different microscope fields.

Semen concentration was determined using the improved Neubauer hemocytometer and applying the direct cell count method. Counting was carried out at 400x magnification. The spermatozoa's head that falls within the sub-divided smaller squares at the four edges and Centre of the hemocytometer were counted. The concentration was expressed (Peters et al., 2008) as: $C = 50,000 \times N \times D$, Where C=concentration of semen per volume (ml),

N=number of sperm cells counted,

D=dilution rate.

Chick quality

Chick quality was assessed based on chick weight. Weight was taken using an electronic balance to the nearest 0.01g.

RESULTS AND DISCUSSION

The semen analysis for three strains of Noiler cocks are presented in table 1. It shows that, in parameters such as colour, pH, total motility, dead sperm, abnormal sperm cells and sperm concentration ($\times 10^9$) there were no significant difference ($p < 0.05$) between the strains however, volume, mass activity and sperm concentration were significantly different ($P < 0.05$). The pH observed in the three strains in this study are similar to those reported by Peters et al. (2008) for Nigeria indigenous cocks. Siudzinska and Lukas Zewicz (2008) indicated that chicken sperm can tolerate a pH range of 6.0 to 8.0. Low pH reduces motility, lactic acid production and oxygen whereas high pH increases metabolic rates in vitro (Donoghue and Wishart, 2000). The sperm concentration observed in this study are similar to those reported by Bah et al. (2001). It is however lower than the reported by Peters et al (2008) for Nigerian cocks. The influence of strain on fertility percentage for incubator A and B are presented in table 2. Statistical difference ($P < 0.05$) were observed from incubator A, where brown strain showed high fertility, followed by spotted and least in black with

83.7%, 80.8% and 75.3% respectively. From incubator B, it shows significant difference ($P<0.05$) with black strain showing highest fertility percentage (86.3%) followed by spotted (78.1%) and least were observed in brown with 72.6%. Table 3 shows the influence of strain on chick quality, from both incubators, it shows that chick quality with regards to weight is statistically not different ($P<0.05$) between strains.

Table 1. Semen characteristics for Three Strains of Noiler Cocks

Parameters	Black	Spotted	Brown	SEM	LS
Volume (ml)	0.61a	0.61a	0.68b	0.005	*
Colour	1.00	1.00	1.00	0.00	NS
PH	7.19	7.30	7.17	0.03	NS
MA	3.72b	3.80a	3.85a	0.01	*
TM (%)	81.37	80.96	81.76	0.29	NS
DS (%)	8.46	8.79	8.95	0.22	NS
AS (%)	2.82	2.74	2.66	0.08	NS
SC (ml)	2.57a	2.42a	2.14b	0.06	*
SC/E (ml)	1.38	1.41	1.45	0.05	NS

Ph = degree of acidity, MA = mass activity, TM = total motility, DS = dead sperm, AS = abnormal sperm, SC = sperm concentration, SCE = sperm concentration/ejaculation, SEM = standard error of mean, LS = level of significance, NS = not significant ($p<0.05$), * = significant ($p<0.05$)

Table 2. Fertility Percentage

Strain	Number of Eggs Set	Number of Fertile Eggs	Fertility Percentage
A			
Black	73	55	75.3
Spotted	73	59	80.8
Brown	73	61	83.7
B			
Black	73	63	86.3
Spotted	73	57	78.1
Brown	73	53	72.6

a, b and c = means within the same row bearing different superscript varies significant

A = automatic incubator

B = water bed incubator

Table 3. Chick Quality at Day Old

Strains	Weight	SEM	LS
A			
Black	39.71	0.64	NS
Spotted	39.67	0.57	NS
Brown	39.38	0.61	NS
B			
Black	39.94	0.38	NS
Spotted	39.00	0.43	NS
Brown	38.91	0.35	NS

SEM = standard error of mean, LS = level of significance, NS = not significant

A = automatic incubator

B = water bed incubator

CONCLUSION AND RECOMMENDATION

The data obtained from this study indicate that there were variations among the stains in parameters such as semen volume, mass activity and semen concentration. However these variations did not influence the quality of day old chicks as no statistical difference was observed. This study there for recommends that any of the three strains of Noiler cocks can be used for breeding purposes.

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