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MULTIVARIATE ANALYSIS OF SEXUAL MATURITY CHARACTERISTICS OF COCKERELS OF BOVAN NERA AND ISA BROWN PARENT STOCK STRAINS IN IBADAN NIGERIA

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ABSTRACT
The objective of the study was to elucidate some of the factors that affect growth and development of breeder cockerels on deep-litter system in the environment. Sexual maturity characteristics in cockerel are important breeding and management indices. Ten records namely cockerel weight at 10 weeks (CW10Wks), cockerel weight at first spermatozoa production (CWFS), cockerel weight at full maturity (CWFM), Feed uptake at 10 Weeks (FU10Wks), Feed uptake at first spermatozoa production (FUFS), feed uptake at full maturity (FUFM), Age at first spermatozoa production (AFS), Age at full maturity (AFM), Batch and genotype were extracted from the record books of a popular Parent stock breeding farm in Ibadan, Nigeria. The study materials were Bovan Nera and Isa Brown Strains. Data were grouped into seasons, maturity group and genotype before they were subjected to ANOVA ($p<0.05$) and multivariate analysis using SAS (V8) and SPSS (17.0) softwares. AFM differ significantly ($p<0.05$) between genotypes in the wet season but was reversed in rank between the two maturity status groups in the environment. Principal Factor Analysis (PFA) elicited Age/maturity status/batch, Cockerel weight, random environmental, Full maturity and Seasonal Factors as important for breeding and management of cockerels on the deep litter in the environment. The lack of significant difference in CWFM between genotypes was an indication of the high level of adaptability of both genotypes to the humid environment.
Keywords: Age at first spermatozoa production, Cockerel weight at 10 Weeks, Cockerel weight at first spermatozoa production, Early maturity characteristics, hot-humid areas.

INTRODUCTION
Factors affecting the onset of sexual maturity in chicken was reviewed and elicited by Asghar and Bashir (1990) as light, temperature, disease, stocking density, nutrition, drugs; and genotype (Odetunde, 2007). It is generally accepted that cockerels mature faster than pullets, but the onset of early sexual maturity of a flock of chickens could be measured by the body weight and age of the pullets in the flock at first egg. Thus sexual maturity of cockerels could be measured at the point of first spermatozoa production. This point was tied to the point of first egg-drop in pullets. The attainment of the minimum required and genetically associated body weight, age at first egg drop and age at first spermatozoa production; body weight and age at full maturity of a flock depend on several factors – chronological age, body weight and body composition (Dunnington and Siegel, 1984; Reddish et al., 2003); including photoperiod, management right from day-old etc. Age at sperm production in intact cockerels (70% of the experimental sample) was reported by Onuora (1987) as 136 days. This research was initiated to study sexual maturity characteristics and possible factors influencing them in breeder cockerel strains managed on the deep litter system in the hot humid environment.

MATERIALS AND METHODS
Data on sexual maturity of Bovan Nera (BN) and Isa Brown (IB) parent stock chicken strains were extracted from the record books of a breeding farm in Ibadan Nigeria. Information on Cockerel body weight at 10 Weeks (CW10Wks), Cockerel body weight at First Spermatozoa production (CWFS), Cockerel body weight at Full Maturity (CWFM), Feed Uptake at 10 Weeks (FU10Wks), Feed Uptake at First Spermatozoa production (FUFS), Feed Uptake at Full Maturity (FUFM), Age at First spermatozoa production (AFS), Age at Full maturity (AFM) and Batch were obtained on both strains. Maturity status group (MSG) was determined by using the Mean of respective strains. Early Maturing Flocks were taken as flocks whose Age at first egg-drop was less than or equal (≤) to the mean age at first egg for the Strain. Late Maturing Flocks were taken as flocks whose Age at first egg-drop was greater than (>) the mean age at first egg-drop for the strain. Seasons were

Wet (April-October, Rainfall=174.25±13.84cm, Relative humidity=80.76±0.68%) and Dry (November-March, Rainfall=23.12±6.01cm, Relative humidity=74.51± 0.83%) respectively. Data was sub-grouped into Seasons and Maturity status group (Early and Late Maturing) before subjecting them to analysis of descriptive statistics, ANOVA, Correlation, Regression and Multivariate analysis of GLM ($p<0.05$) using Statistical Analytical Systems (SAS Version 8) software while Principal Factor Analysis (PFA) was conducted using Statistical Package for Social Sciences (SPSS 17) software. The study design was Latin Square to remove identified sources of variations due to Season and Strain. The statistical model was:

$$Y_{ijk} = \mu + R_i + C_k + T_j + \varepsilon_{ijkl}$$

Where i=2, j=2, k= 2; Y_{ijkl} = observation in the ith row, kth column for the jth treatment and lth replicate, μ = Overall unknown Mean, R_i = Effect of ith Row (Season) , C_k = Effect of kth Column (Maturity status group), T_j = Effect of jth Treatment (Strain/genotype), ε_{ijkl} = Random error.

RESULTS AND DISCUSSIONS

Table 1 shows the descriptive statistics of sexual maturity parameters of Bovan Neara (BN) and Isa Brown (IB) cockerels classified by season, genotype and maturity group. Within wet season, there was significant ($p<0.05$) difference between the two genotypes in CWFS, AFS and AFM in both maturity groups. Within the dry season and between genotypes, there was significant ($p<0.05$) difference in CW10Wks in both maturity groups. CWFS and AFS were 1669.44-1798.00, 1204.64-1647.84 gm and 116-133, 104-126 days in BN and IB respectively. These implied that wet season and maturity status group were important factors in the development of cockerels. These had impacted on the differentiation of CWFS, AFS and AFM between genotypes. Dry season also had positive effect on genotypes in CW10Wks in both maturity groups. This probably influenced the body weight of both genotypes later at full maturity stage in both maturity groups in the dry season. Both genotypes therefore could tolerate drier atmospheric conditions and perform close to their genetic potentials in both maturity groups. AFS obtained in this study (104-133 days) were less than 136 days reported for 70% of experimental intact males by Onuora (1987). These results meant that Maturity status of strain could have great influence on CWFS and AFS between genotypes. The results on CWFM implied that the differences observed between genotypes had waned out at Full Maturity period of the Cockerels. Growth after full maturity stage would be dictated by genotypic merit and other factors such as management, Nutrition and feeding level. Table 2 shows the Principal Factors and parameters retained on analysis of data within genotypes. Bovan Nera factors were heavily loaded by Age/ maturity status; Cockerel weight; Random and Full maturity factors respectively. These contributed about 82.58% of the variability involved in describing these factors that influenced cockerel growth and development in the BN. Communality values were high ranging between 0.550 and 0.988. Isa Brown Factors were also highly loaded by Age/maturity status/batch; Cockerel weight1/Season and Cockerel weight2 Factors respectively. Total contribution of all factors to body weight development was 82.31%. The communality values ranged between 0.684 and 0.919 indicating that AFS, CWFS, AFM, CW10Wks, CWFM, MSG and Batch of genotypes were important traits affecting breeding on the deep litter system. The values for IB were higher than those for BN, implying that IB could be more sensitive to management than BN.

CONCLUSION

Study revealed that Age and body weight of cockerels at first spermatozoa between Bovan Nera and Isa Brown differ significantly in the wet season. CW10Wks, AFS, CWFS, AFM and CWFM were important traits. Four factors were extracted for BN namely Age/maturity status, cockerel weight, Random and Full maturity; while three factors were extracted for IB genotype namely Age/maturity status/batch, cock weight and Season. These were important factors having impact on the development of Cockerels in the environment.

REFERENCES

Asghar, A. M. and Bashir, M. B. 1990. Effect of day-length on sexual maturity and initial egg weight in the Fayoumi pullets. Research Note. *Pakistan Journal of Agricultural Research.* Volume 11 (1): 70-72.

Dunnington, E. A. and Siegel, P. B. 1984. Age and Body Weight at Sexual Maturity in Female White Leghorn Chickens. *Poultry Science.* Volume 63 (4):828-830.

Odetunde, R. B. 2007. Comparison of the growth performance of Nigerian Fulani Ecotype Chicken and Nigerian Local Chickens. Unpublished B. Agric project. Department of Animal Production, University of Ilorin.

Onuora, G. I. 1987. Body weight, semen quality and age at sperm production of hemicastrated and intact cockerels (Gallus domestica) Journal of Reproductive fertility. Volume 81: 357-361.

Reddish, J. M., Nestor, K. E. and Lilburn, M. S. 2003. Effect of Selection for Growth on Onset of Sexual Maturity in Random-bred and Growth-Selected Lines of Japanese Quail. *Poultry Science*. Volume 82:187–191. In Oruwari, B. M. and Brody T., 1988.

SAS/STAT Version 8. 1999. Statistical Analytical Systems Computer software. SAS Institute Incorporated, N.C, USA.

SPSS Statistics 17.0. 2007. Statistical Package for Social Sciences Software Package. SPSS Incorporated, Illinois. USA.

Table 1: Descriptive Statistics of Sexual Maturity Parameters of Bovan Nera and Isa Brown Cockerels by Season, Genotype and Maturity Group

Genotype	Season	Maturity Group	N	CW10Wks	CWFS	CWFM	AFS	AFM
BN	Wet	Early	6	867.78±58.65	1671.42±43.63^{a}	2486.07±72.22	116±2^{a}	218±16^{a}
IB			6	933.57±40.13	1490.55±75.79^{b}	2411.77±51.18	104±2^{b}	193±8^{b}
BN		Late	4	922.06±35.74^{a}	1775.45±53.73^{a}	2375.00±55.87	128±2^{a}	208±10^{b}
IB			4	772.552±26.89^{b}	1517.58±97.22^{b}	2374.93±57.47	119±1^{b}	235±18^{a}
BN	Dry	Early	3	934.00±2.00^{a}	1669.44±52.39^{a}	2343.80±77.44	119±2	229±23
IB			3	658.75±52.71^{b}	1204.64±87.30^{b}	2077.50±49.95	105±2	182±2
BN		Late	4	700.00±67.55	1798.00±115.5	2359.25±111.02	133±3	195±9
IB			4	726.64±70.65	1647.84±296.17	2408.5±143.52	126±7	200±4

KEY: Means ± Standard Error; BN = Bovan Nera; IB = Isa Brown

Table 2: Principal Factors, Eigen vectors, Communalities and Eigen values for Parameters of Bovan Nera and Isa Brown Cockerel Strains

Genotype	Bovan Nera					Isa Brown			
Factor	PF1	PF2	PF3	PF4	Comm.	PF1	PF2	PF3	Comm.
Factor Name	Age/	CW	Random	FM		Age/MSG	CW1/	CW2	
Parameters	Status					Batch	Season		
Season	0.331	-0.390	0.536	0.041	0.550	-0.003	-0.871	0.116	0.772
Batch	-0.130	-0.010	0.825	0.191	0.734	0.805	-0.304	-0.029	0.741
AFS	0.975	-0.086	0.099	-0.141	0.988	0.935	-0.136	0.164	0.919
MSG	0.830	-0.111	-0.138	-0.289	0.804	0.905	-0.075	0.196	0.863
CW10wks	-0.187	0.870	-0.098	-0.182	0.834	-0.526	0.736	-0.236	0.874
CWFS	0.464	0.833	-0.003	0.033	0.910	0.223	0.634	0.591	0.801
CWFM	-0.100	-0.358	-0.624	0.446	0.726	-0.155	0.884	0.217	0.853
AFM	-0.090	-0.022	0.119	0.919	0.868	0.526	0.453	0.449	0.684
Initial Eigenvalues	3.072	2.419	1.656	1.111		4.115	2.931	1.185	
RSS Loadings	2.951	2.312	1.700	1.295		3.740	2.843	1.648	
% Variance	29.509	23.119	17.004	12.952		37.399	28.429	16.479	
% Cummulative	29.509	52.628	69.632	82.584		37.399	65.829	82.307	

KEY: PF = Principal Factor, Comm. = Communality, CW = Cockerel weight, FM = Full Maturity, MSG =Maturity status group.