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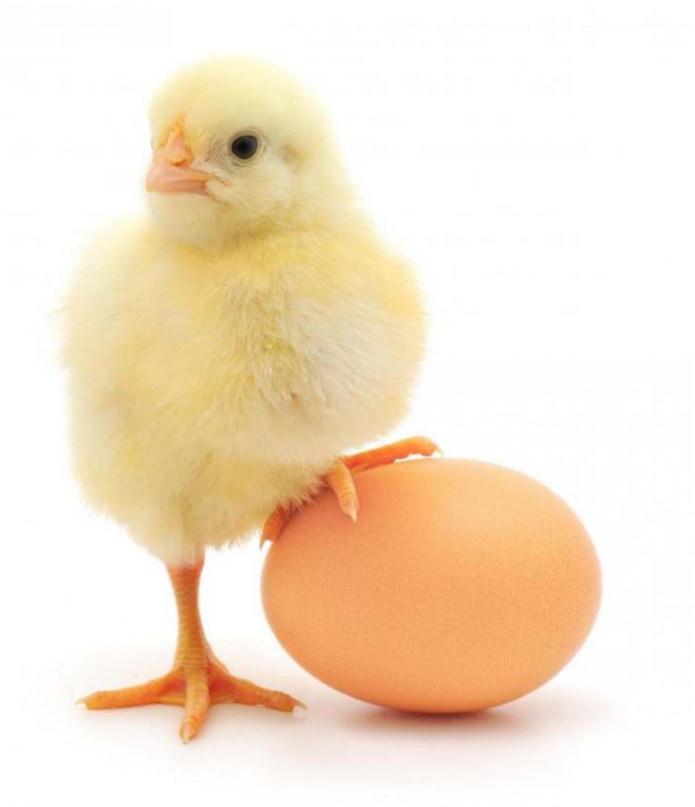

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Predicting Semen Attributes of Naked Neck and Normally Feathered Male Chickens from Live Performance Traits

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Abstract: The current research was conducted to estimate the prediction equations of semen characters from live performance traits. The performance traits were body weight (BW) and length of shank (SL), comb (CL) and wattle (WL). For this purpose 102 cocks (26 Fayoumi-Nana, 25 Fayoumi-nana, 27 Dandarawi-Nana and 24 Dandarawi-nana) were used. The Fayoumi strain had significantly wider wattle length, higher abnormal sperms and lower coiled tail sperms compared to Dandarawi one. With respect to naked neck (Na) gene, the results indicated that the Na gene had taller CL, wider WL, higher semen volume and lower PSV and higher abnormal sperms compared to normally feathered genotype. In all genetic groups, the coefficients of sample correlation between the body weight and PSV were highly positive and statistically significant. Also, both PSV and abnormal sperms were significantly correlated with BW, CL and WL. Within Dandarawi strain, the BW, CL and WL are good predictors for semen volume in Nana genotype. However, BW alone is good predicator of semen volume in nana genotype. Moreover, within Fayoumi strain, the BW and WL are good predicators for semen volume in Nana genotype. Also, the CL alone is a good predictor for semen volume in nana genotype. The BW, CL and WL are good predictors for PSV in both Fayoumi-nana ($R^2 = 0.75$) and Fayoumi-Nana ($R^2 = 0.65$). According to the findings in this study, it may be concluded that the body weight and lengths of shank, comb and wattle are good predictors of semen attributes in chickens. Moreover, the accuracy of prediction equations (R^2) increased with the presence of naked neck (Na) gene, in Fayoumi strain, but not in Dandarawi one.

Key words: Dandarawi, fayoumi, naked neck, live performance, semen quality

Introduction

Accurate and reliable prediction equations for estimating semen characters from *in vivo* measurements are required by poultry breeders. The most accurate method for the evaluation the semen measurements are collection of semen followed by microscopically examination. However, this method is stressful for the bird, time consuming and costly. Thus, simple, reliable and indirect methods for *in vivo* estimation of semen attributes based upon the correlation between particular traits and parameters were needed. Literature provides scant information on selection directed toward improving the semen characters in male chickens.

Numerous studies (Dourgham, 1980; Hossari, 1980; El-Sayiad *et al.*, 1994; Abdellatif, 1999) have recommended the use of lengths of comb and wattle as good indicators for selection of quantitative traits in chickens. Behavioral studies in sexual selection of red jungle fowl show female preference for males with larger combs (Zuk *et al.*, 1995; Ligon and Zwartjes, 1995). Larger combs may reliably indicate roosters with greater semen production (Burrows and Titus, 1939), higher androgen levels (Gilbert, 1971), or increased mating activity (Ligon *et al.*, 1990). Additionally, male comb area may indicate health status. The immunocompetence theory asserts that well-developed secondary sexual characters indicate a male's ability to avoid parasitization and maintain good health (Hamilton and Zuk, 1982). For example, highly parasitized male red jungle fowl possess smaller combs than healthy males (Zuk *et al.*, 1998). Female's preference for males with developed secondary sexual characters increases their likelihood of selecting a healthy male in good reproductive conditions (Nur and Hasson, 1984; Pomiankowski, 1987; Moller, 1994; Zuk *et al.*, 1995). Positive correlation between wattle length, comb length and fertility indicates that the development of secondary sexual characters may convey male reproductive quality in some genetic strains (McGary *et al.*, 2003). Number of spermatozoa per ejaculate and body weight were positively correlated (Wilson *et al.*, 1988). This is contrary to the reported negative influence of body weight on semen production (Scogin *et al.*, 1982). However, Harris *et al.* (1984) observed a positive relationship between body weight and semen volume when males were 48 wk of age, but the relationship was not present when males were 30 or 40 wk of age. Recently, Galal *et al.* (2002) indicated that genes that govern lengths of shank, comb and wattle would tend to be inherited linked with genes controlling ejaculate volume and sperm concentration, but independently of those controlling sperm motility and abnormal sperms. From this view, this experiment was designed to develop prediction equations to estimate the semen characters using *in vivo* information in terms of body weight and lengths of shank, comb and wattle of naked neck and normally feathered genotypes issued from Dandarawi and Fayoumi native strains.

Materials and Methods

Genetic flocks and management: This experiment was carried out at Poultry Breeding farm, Poultry Production Department, Faculty of Agriculture, Ain Shams University. A total of 102 cocks aged 30 weeks of age (26 Fay-Nana, 25 Fay-nana, 27 Dan-Nana and 24 Dan-nana) were taken from F1 of the crossing between 10 heterozygous naked neck (Nana) males and 100 normally feathered (nana) females (50 Fayoumi and 50 Dandarawi). All cocks were individually weighed, housed in batteries with single cages and fed diet with 18% crude protein and 2900 kcal ME/kg diet up to 40 weeks old. Birds were subjected to 14L: 10D lighting regime with free access to feed and water. Temperature of house birds was fluctuated between 28.5 and 31.7°C during the experimental period.

Measurements and observation: Body weights were recorded at 40 weeks of age. Also, shank length was determined on live birds by measuring the length of the tibiotarsus (from the top of hock joint to the foot pad) with a digital caliper. Head appendages (comb and wattle) were measured using a measuring tape as a distance between the upper and the lower point of the organ. Semen samples were collected free of transparent fluid by abdominal massage technique. Ejaculate volume (ml) was measured using 2 ml pipette. Sperm motility was estimated just after semen collection by microscopic examination. Advanced motility was expressed as a percentage of actual progressive motion. Packed sperm volume (PSV), which was considered as a guide to sperm concentration, was determined by centrifugation of capillary tubes at 5000 rpm for 15 min. Abnormal sperms, coiled tail and dead sperms were counted in a number of 200 sperms and then calculated as a percentage.

Statistical analysis: Data were subjected to a two-way analysis of variance with strain and genotype effect using the General Linear Models (GLM) procedure of SAS User's Guide, 2001 and their interaction. The data were analyzed according the following model;

$Y_{ijk} = \mu+S_i+G_j+(S^* G)_{ij}+e_{ijk}$
Where;
μ = Overall mean,
Si = strain effect (I = 1, 2),
Gj = genotype effect (j = 1, 2),
(S*G)ij = interaction between strain and genotype,
eijk = experimental error.

Correlation coefficients among the live performance parameters and semen characters for each genotype within strain were calculated using PROC CORR procedure. Stepwise regression analysis (PROC REG) was used to determine and verify the factors affecting semen attributes for each genotype within strain according to the following model:

$Y_{ij} = a+b_1X_1+b_2X_2+b_3X_3+b_4X_4+e_{ij}$
Where;
Y_{ij} = the dependent variable of the i^{th} bird;
a = intercept,
$X_1 \ldots X_4$ = the p^{th} independent variable of the i^{th} bird,
$b_1 \ldots b_4$ = regression coefficients of Y on Xs,
e_{ij} = experimental error.

Results and Discussion

Live performance parameters: Data presented in Table 1 showed that the live performance parameters as affected by strain, genotype and their interaction. There was no significant difference between strains for body weight, shank length and comb length. Conversely, the Fayoumi strain had significantly wider wattle length compared to Dandarawi one. With respect to naked neck (Na) gene, it could be speculated that the body weight did not significantly affected by the Na gene. However, the presence of Na gene associated with significantly higher length of shank compared to normally feathered counterparts.

Selection for important economic traits may accompany altered secondary sexual characters. These modifications may result in lower fertility and reduced libido. The present result speculated that the presence of Na allele associated with significantly taller comb and wider wattle lengths compared to normally feathered counterparts. On one hand, the presence of Na gene may increase libido and frequency of mating. On the other hand, comb, wattle, and shank length are considered as means to heat dissipation or heat release. Naked neck genotype had longer shank length than the normal neck. This higher length in leg enhanced the releasing of additional heat along with main pathways through comb and wattles. Therefore, the naked neck birds had more bare area and this assist to tolerate more heat stress than fully feathered sibs. Under moderate or high ambient temperatures, Zongo and Petitjean (1990); Fathi *et al.* (2000) and Galal and Fathi (2002) reported that the Nana genotype was significantly longer comb and wider wattle lengths compared to normally feathered counterparts.

Semen characteristics: Data summarized in Table 2 showed that the semen characters of male chickens as affected by strain, genotype and their interaction. There was no significant difference between strains for semen volume, advanced motility, packed sperm volume or dead sperms. Inversely, the abnormal sperms of Fayoumi strain was significantly higher than that of Dandarawi one. Opposite trend was noticed for coiled tail sperms, where the Fayoumi strain had significantly lower coiled tail sperms compared to Dandarawi one.

Table 1: Live performance traits (Mean±SE) of male chickens at 40 weeks of age as affected by strain, genotype and their interaction

	Live performance traits			
	Body weight (kg)	Shank length (cm)	Comb length (cm)	Wattle length (cm)
Strain (S)				
Dandarawi (Dan)	1.853±0.223	11.5±0.12	7.63±0.09	6.18±0.13
Fayoumi (Fay)	1.860.9±0.204	11.56±0.10	7.57±0.09	6.38±0.12
Level of significance	NS	NS	NS	0.03
Genotype (G)				
Nana	1.856.98±0.189	12.17±0.04	8.10±0.05	7.02±0.04
nana	1.848.91±0.235	10.88±0.05	7.11±0.06	5.56±0.06
Level of significance	NS	0.001	0.001	0.001
G*S				
Dan-Nana	1.837.0±0.323	12.20±0.06	8.11±0.06	7.01±0.07
Dan-nana	1.868.2±0.311	10.81±0.05	7.08±0.07	5.43±0.07
Fay-Nana	1.890.1±0.291	12.14±0.06	8.09±0.07	7.03±0.03
Fay-nana	1.830.5±0.310	10.96±0.07	7.15±0.08	5.70±0.09
Level of significance	NS	NS	NS	0.05

Table 2: Semen characteristics (Mean±SE) of male chickens at 40 weeks of age as affected by strain, genotype and their interaction

	Semen characters					
	Semen volume (ml)	Advanced motility (%)	PSV (%)	Abnormal sperms (%)	Dead sperms (%)	Coiled tail (%)
Strain (S)						
Dandarawi (Dan)	0.86±0.04	92.86±1.57	11.71±0.43	11.71±0.52	7.50±0.34	5.92±0.37
Fayoumi (Fay)	0.81±0.04	89.57±1.58	11.10±0.30	13.45±0.64	7.91±0.39	5.00±0.38
Prob.	NS	NS	NS	0.01	NS	0.02
Genotype (G)						
Nana	0.97±0.04	89.32±1.75	11.03±0.36	14.23±0.62	8.45±0.34	6.39±0.33
nana	0.71±0.03	92.89±1.38	11.74±0.38	11.07±0.46	7.00±0.37	4.51±0.38
Prob.	0.001	NS	NS	0.001	0.001	0.001
G*S						
Dan-Nana	0.96±0.06	92.50±2.39	11.10±0.58	11.40±0.74	6.90±0.30	5.95±0.53
Dan-nana	0.78±0.04	93.18±2.12	12.26±0.61	12.00±0.74	8.05±0.58	5.91±0.54
Fay-Nana	0.98±0.05	86.67±2.30	10.96±0.41	16.58±0.53	9.75±0.37	6.75±0.37
Fay-nana	0.64±0.03	92.61±1.57	11.24±0.36	10.17±0.41	6.00±0.30	3.17±0.30
Prob.	NS	NS	NS	0.001	0.001	0.001

With respect to genotype effect, the present result indicated that the presence of Na allele associated with significantly higher semen volume compared to nana genotype. Inversely, the Nana genotype was lower advanced motility and packed sperm volume compared to nana one. Furthermore, the presence of Na allele was significantly increased abnormal, dead and coiled tail sperms compared to normally feathered genotypes. These results were confirmed with El-Wardany and Zein El-Dein (1995); Fathi *et al.* (1998); Galal *et al.* (2000). They reported that the naked neck cocks have criticized for their proportionally higher semen volume, lower packed sperm volume, lower advanced motility, higher abnormal sperms, and higher coiled tail sperms. The abnormal, dead and coiled tail sperms were significantly affected by interaction between strain and naked neck gene. Within Fayoumi strain, the presence of Na gene increased abnormal, dead and coiled tail sperms by 63.0, 62.5 and 112.9%, respectively compared to nana genotype. However, within Dandarawi strain, the presence of Na gene decreased abnormal and dead sperms by 5.0 and 14.3%, respectively compared to nana genotype. Moreover, there was no difference between genotypes for coiled tail sperms.

Correlations: The present study aimed to derive multiple regression equations for prediction of semen characters. Thus, it was necessary to determine the suitability of various traits measured on live birds for indirect estimation of the semen characteristics. Their suitability for this purpose depends primarily on the presence of high correlation between certain body measurements and semen characters. Data presented in Table 3 show that coefficient of simple correlations between the live performance measurements and semen characters. Significantly negative relationship between body weight and semen volume was observed in all genetic groups, except of Fayoumi-Nana genotype, whereas the association between body weight and semen volume was significantly positive. Several authors (Harris *et al.*, 1984; Marks, 1985; Siegel and Dunnington, 1985) observed a positive relationship between live body weight and semen volume. Inversely, Scogin *et al.* (1982) found a negative correlation between body weight and semen volume.

Genetically increased growth rate has negative influences on reproductive traits of cockerels. Estimated and realized genetic correlation between body weight and motility of spermatozoa are negative (Siegel and

Table 3: Phenotypic correlation coefficients between live performance parameters and semen characters

	Live performance parameters				
Semen characters	Body weight	Shank length	Comb length	Wattle length	Genotype
Volume	-0.40	-0.25	-0.78**	0.76**	D-Nana
	-0.83***	0.40	-0.73**	-0.75**	D-nana
	0.85***	-0.61*	0.67**	0.74**	F-Nana
	-0.42*	-0.14	0.81***	-0.70**	F-nana
Adv. Motility	-0.55*	-0.08	0.43*	0.41	D-Nana
	0.31	-0.25	0.37	0.23	D-nana
	-0.86***	0.72**	-0.87***	-0.74**	F-Nana
	0.52*	0.12	-0.78**	0.57*	F-nana
PSV	0.50*	0.13	0.80***	-0.81***	D-Nana
	0.81***	-0.39	0.75**	0.74***	D-nana
	0.88***	-0.80**	0.82***	0.76**	F-Nana
	0.53*	0.14	-0.79**	0.70**	F-nana
Abnormal	0.51*	-0.01	-0.46*	-0.44*	D-Nana
	0.83***	-0.41	0.85***	0.70**	D-nana
	-0.86***	0.87***	-0.82***	-0.88***	F-Nana
	-0.59*	-0.21	0.81***	-0.78**	F-nana
Dead	0.51*	0.08	0.50*	0.50*	D-Nana
	-0.18	0.32	-0.19	-0.04	D-nana
	-0.83***	0.84***	-0.91	-0.95	F-Nana
	0.10	0.06	0.22	-0.02	F-nana
Coiled tail	0.42	-0.26	0.17	-0.09	D-Nana
	0.10	0.02	0.09	0.03	D-nana
	-0.83***	0.85***	-0.92***	-0.95***	F-Nana
	0.05	-0.17	0.49*	-0.35	F-nana

$^{*}P<0.05$, $^{**}P<0.01$, $^{***}P<0.001$

Dunnington, 1985). The present result indicated that the live body weight was significantly negatively correlated with advanced motility in both Dandarawi-Nana and Fayoumi-Nana genotypes. Inverse relationship was observed in Dandarawi-nana and Fayoumi-nana genotypes. Altered musculoskeletal conformation due to selection for high yield cause difficulty in successfully transferring sperm into the oviduct during mating (McGary *et al.*, 2003), whereas Soller and Rappaport (1971); Bowling *et al.* (2003) observed that sperm motility and mobility are negatively associated with body weight.

Males from high weight lines produce ejaculate of greater volume, but lower concentration of spermatozoa (Marks, 1985; Siegel and Dunnington, 1985). The present result observed that the coefficients of sample correlation between the live body weight and packed sperm volume, which was considered as a guide to semen concentration, were strong positive and statistically significant in all genotypes. The last result could be attributed to the both Dandarawi and Fayoumi strains were not subjected to intensive selection program and consequently, high additive and non-additive genetic variation.

Live body weight was significantly negative correlated with abnormal sperm percent in both nana and Nana Fayoumi males. Opposite trend was noticed in both Dandarawi genotypes, whereas there was significantly positive relationship between body weight and abnormal sperm percent. Positive relationship between live body weight and both dead and coiled tail sperm percentages was observed in Dandarawi-Nana genotype. Conversely, significantly negative correlation between body weight and both dead and coiled tail sperm percentages was noticed in Fayoumi-Nana genotype. Ejaculate from cockerels of lines selected for high as opposite to low juvenile weight tend to contain spermatozoa with lower metabolic rates and higher percentages of dead and abnormal sperms (Siegel and Dunnington, 1985).

Leg size does not seem to have direct (positive or negative) on male fertility levels (McGary *et al.*, 2003). However, the higher length in leg enhanced the releasing of additional heat along with main pathways through comb and wattles. The present result indicated that shank length was negatively correlated with semen volume in all genetic groups, except of Dandarawi-nana genotype. Significantly positive relationships between shank length and advanced motility (r_p = 0.72), abnormal (r_p = 0.87), dead (r_p = 0.84) and coiled tail (r_p = 0.85) sperm percentages were observed in Fayoumi-Nana genotype. However, these correlations were low in other genetic groups.

Comb and wattle growth are androgen dependent (Zeller, 1971) and have been shown to correlate with a male's health status in red jungle fowl (Hamilton and Zuk, 1982). Also, the relationship between secondary sexual characters and fertility was confirmed in domestic fowl by McGary *et al.* (2003), who found that male broiler breeders with larger combs within specific strains were likely to have higher fertility, as a significant positive correlation was found between strain A males and their individual fertility level. As such, if female broiler breeders more frequently crouch for and subsequently mate with males having large, symmetrical comb and wattle, differential fertility may be related to the fact that high quality males secure a higher mating frequency. Within Dandarawi strain, there was significantly negative relationship between comb length and semen volume in both nana and Nana genotypes. Conversely, within Fayoumi strain, there was significantly positive correlation between comb length and semen volume in both nana and Nana genotypes. Significantly positive relationship (r_p = 0.43) between comb length and advanced motility was observed in Dandarawi-Nana genotype. Similar trend, but not statistically significant, was noticed in Dandarawi-nana counterparts. Conversely, within Fayoumi strain, it could be showed that significantly negative correlation between comb length and advanced motility in both nana and Nana genotypes. Significantly positive relationship between comb length and PSV was noticed in all genetic groups, except of Fayoumi-nana genotype. Comb length was significantly negative correlated with abnormal sperm percentage in both Fayoumi and Dandarawi naked neck genotypes. Inversely, this relationship was significantly

Table 4: Regression equations to predict semen characters at 40 weeks old from live performance parameters (Fayoumi males)

			Regression coefficients for:				
Genotype	Predictant	Intercept	Body weight	Shank length	Comb length	Wattle length	Accuracy (R^2)
Nana	Volume, ml	-4.07	0.003	……	……	………	0.723
		-1.74	0.004	…...	……	-0.57	0.752
		1.58	0.004	-0.15	……	-0.81	0.759
nana		-1.53	………	……	0.30	………	0.656
Nana	Adv. Motility, %	525.90	………	……	……	-62.46	0.786
		738.37	………	-9.78	……	-75.76	0.803
		824.21	………	-16.30	-12.46	-62.40	0.826
nana		195.67	………	……	-14.42	………	0.601
		158.05	0.01	……	-12.53	………	0.658
		253.13	0.03	……	-20.20	-11.59	0.694
Nana	PSV, %	-68.31	………	……	……	11.27	0.578
		-59.85	………	……	1.89	7.89	0.635
		-52.42	0.005	……	1.92	5.47	0.648
		-77.23	0.004	1.22	2.49	6.40	0.654
nana		38.28	………	……	-3.78	....	0.624
		30.90	0.003	……	-3.41	………	0.672
		44.00	0.005	……	-4.47	-1.60	0.695
Nana	Abnormal, %	123.07	………	……	…..	-15.14	0.774
		115.38	………	……	-1.72	-12.07	0.778
nana		-21.44	………	……	4.42	………	0.656
		-10.85	-0.004	……	3.89	………	0.691

Table 5: Regression equations to predict semen characters at 40 weeks old from live performance parameters (Dandarawi males)

			Regression coefficients for:				
Genotype	Predictant	Intercept	Body weight	Shank length	Comb length	Wattle length	Accuracy (R^2)
Nana	Volume, ml	8.05	………	………	-0.88	………	0.608
		8.13	-0.0002	………	-0.85	………	0.673
		4.78	-0.0001	………	-0.63	0.22	0.680
		5.15	-0.0001	-0.07	-0.59	0.24	0.705
nana		3.27	-0.001	………	………	………	0.689
Nana	Adv. Motility, %	167.06	-0.04	………	………	………	0.300
nana		16.39	………	….....	10.84	………	0.134
Nana	PSV, %	65.88	………	………	………	-7.81	0.656
		53.33	0.004	………	………	-7.18	0.693
nana		-45.35	………	………	8.14	………	0.563
		-43.56	………	………	4.72	4.11	0.580
Nana	Abnormal, %	-9.85	0.01	………	………	………	0.260
		18.73	0.009	………	………	-3.50	0.350
nana		-57.31	………	………	9.79	………	0.723
		-55.93	………	………	7.17	3.17	0.762

positive in both Fayoumi and Dandarawi normally feathered counterparts. Dead sperm percentage was significantly positive correlated (r_p = 0.50) with comb length in Dandarawi-Nana genotype. Inversely, this correlation was significantly negative (r_p = -0.91) in Fayoumi-Nana genotype. Within Fayoumi strain, the coiled tail sperm percent was significantly negative correlated (r_p = -0.92) with comb length in Nana genotype. Opposite relationship (r_p = 0.49) was noticed in nana counterparts.

Wattle length was significantly positive correlated with semen volume in both Fayoumi-Nana and Dandarawi-Nana genotypes. Inverse relationship was noticed in remaining genotypes. Advanced motility was positively correlated with wattle length in all genetic groups, except of Fayoumi-Nana genotype. Likewise, PSV was significantly positive correlated with wattle length in all genetic groups, except of Dandarawi-Nana genotype. Abnormal sperm percent was significantly negative correlated with wattle length in all genotypes, except of Dandarawi-nana genotype. Wattle length was significantly negative relationship with dead and coiled tail sperm percentages in Fayoumi-Nana genotypes. Males with a high frequency of mating would have larger secondary sexual characters, high sperm quality and ultimately sire more progeny when housed in groups (Bilcik *et al.*, 2005). Also, McGary *et al.* (2003) indicated that broiler breeder males with more symmetrically wattles and tibia length had higher fertility.

Generally, there is high correlation between semen characteristics and body weight, comb length, and wattle length. This suggests that these parameters may be good indicators for semen characteristics in chickens.

Prediction equations: Regression equations of semen characters on live parameters with their accuracy of predication (R^2) values for Nana and nana genotypes issued from Dandarawi and Fayoumi strains are given in Tables 4 and 5. Within Dandarawi strain, body weight (BW) and lengths of comb (CL) and wattle (WL) are good predictors for semen volume in Nana genotype (R^2 = 0.68). However, the BW alone is good predicator of semen volume in nana genotype (R^2 = 0.69). Moreover, within Fayoumi strain, the BW and WL are good predictors for semen volume in Nana genotype (R^2 = 0.75). Also, the CL alone is good predictor for semen volume in nana genotype (R^2 = 0.66).

Prediction of advanced motility in Fayoumi-Nana genotype based on SL, CL and WL (R^2 = 0.83) was more accurate than the based on WL alone (R^2 = 0.79). Also, in Fayoumi-nana genotype, the BW, CL and WL are good predictors (R^2 = 0.69) for advanced motility than those of BW and CL (R^2 = 0.66). The accuracy of prediction equations for both Nana and nana Dandarawi genotypes is very low. This suggests that these traits cannot be considered reliable predictors of advanced motility.

The BW, CL and WL are good predictors for PSV in both Nana and nana Fayoumi genotype. Within Dandarawi strain, the BW and WL are good predictors for PSV in Nana genotype. However, in nana genotype, the CL and WL are good predictors for PSV. The best equations for predicting PSV were as follows:

PSV = -52.42+0.005BW+1.92CL+5.47WL
(R^2 = 0.68)……Fayoumi-Nana
PSV = 44.00+0.005BW-4.47CL-1.60WL
(R^2 = 0.70)….. Fayoumi-nana
PSV = 53.33+0.004BW-7.18WL
(R^2 = 0.69)………Dandarawi-Nana
PSV = -43.56+4.72CL+4.11WL
(R^2 = 0.58)...........Dandarawi-nana

The lengths of comb and wattle are good predictors for abnormal sperms in Fayoumi-Nana and Dandarawi-nana genotypes. However, the BW and either CL or WL are good predictors for abnormal sperms in Fayoumi-Nana and Dandarawi-nana genotypes, respectively.

According to the findings in this study, it may be concluded that the body weight and lengths of shank, comb and wattle are good predicators of semen attributes in male chickens. Moreover, the accuracy of predication equations (R^2) increased with the presence of naked neck (Na) gene, in Fayoumi strain, but not in Dandarawi one. Also, because of the discrepancy of results between theses two breeds and genotypes, this suggests that independent strain evaluation must be conducted to characterize the most reliable phenotypic semen quality indicators in each case.

References

Abdellatif, M.A., 1999. Inheritance of comb and wattle lengths and its as indicators to select cockerels in a population of Dandarawi chicken. Assuit J. Agri. Sci., 30: 123-131.

Bilcik, B., I. Estevez and E. Russek-Cohen, 2005. Reproductive success of broiler breeders in natural mating systems: The effect of male-male competition, sperm quality, and morphological characteristics. Poult. Sci., 84: 1453-1462.

Bowling, E.R., D.P. Froman, A.J. Davis and J.L. Willson, 1939. Attributes of broiler breeders males characterized by low and high sperm mobility. Poult. Sci., 82: 1796-1801.

Burrows, W.H. and H.W. Titus, 1939. Some observation on the semen production of the male fowl. Poult. Sci., 18: 8-10.

Dourgham, S.A., 1980. Genetic differences between two strains in Fayoumi chicken with special reference to heterosis. M.Sc. thesis, Ain Shams University, Cairo, Egypt.

El-Sayiad, G.H., M.A. Hossari, K.A. Yamani, H.M. Sabri and A. Abdel-Warith, 1994. A genetical study on Egyptian Fayoumi fowl. Egypt. Poult. Sci., 14: 285-315.

El-Wardany, I. and A. Zein El-Dein, 1995. Testis histology and semen quality of naked neck cocks as affected by vitamin E and selenium supplementation. J. Agri. Sci. Mansoura University, 20: 2853-2861.

Fathi, M.M., A.Galal and N.M. El-Medany, 2000. Multiple regression equations for the predication of feed intake in naked neck chickens under moderate temperature. Egypt. Poult. Sci., 20: 961-980.

Fathi, M.M., I.E. El-Wardany, Y.M. El-Hommosany, U.M. Ali, A.G. Gad and A. Zein El-Dein, 1998. Some hematological and semen quality aspects of naked neck and frizzle genotypes. Egypt. Poult. Sci., 18: 199-216.

Galal, A., U.M. Ali, N.M. Gamal El-Dein, N.M. El-Medany and Sh.F. Al-Afifi, 2000. Semen quality, body weight and food intake of naked neck and normally feathered cocks as influenced by dietary protein. J. Agri. Sci. Mansoura University, 9: 5227-5239.

Galal, A. and M.M. Fathi, 2002. Introducing crest gene to enhance productive performance of naked neck chickens under moderate ambient temperature. Egypt. Poult. Sci., 22: 611-628.

Galal, A., A.R. Shemeis and M.M. Fathi, 2002. Selection indexes to improve semen quality of naked neck cocks. Egypt. Poult. Sci., 22: 1143-1157.

Gilbert, A.B., 1971. The endocrine ovary in reproduction. Pages 1449-1468 in: Physiology and Biochemistry of the Domestic Fowl, Vol.3. Academic Press, London.

Hamilton, W.D. and M. Zuk, 1982. Heritable true fitness and bright birds: A role for parasites? Sci., 218: 384-387.

Harris, G.C., J.A. Benson Jr and R.S. Sellers, 1980. The influence of day length, body weight and age on the productive ability of broiler breeder cockerels. Poult. Sci., 63: 1705-1710.

Hossari, M.A., 1980. Review on the improvement of Fayoumi fowl with particular reference to a flock at Fayoumi Research Station. Agri. Res. Rev., 58: 171-190.

Ligon, J.D., R. Thornhill, M. Zuk and C. Johnson, 1990. Male male competition, ornamentation, and the role of testosterone in sexual selection in the red jungle fowl. Anim. Behav., 40: 367-373.

Ligon, J.D. and P.W. Zwartjes, 1995. Ornate plumage of male red junglefowl does not influence mate choice by females. Anim. Behav., 49: 117-125.

Marks, H.L., 1985. Direct and correlated responses to selection for growth: In: Hill, W.G., J.M. Manson and D. Hewitt, editors. Poultry Genetic and Breeding. Br. Poult. Sci. Symp., 18.

McGary, S., I. Estevez, M.R. Bakst and D.L. Pollock, 2003. Phenotypic traits as reliable indicators of fertility in male broiler breeders. Poult. Sci., 81: 102-111.

Moller, A.P., 1994. Sexual Selection and the Bran Swallow. Oxford University Press, Oxford, UK.

Nur, N. and O. Hasson, 1984. Phenotypic plasticity and the handicap principle. J. Theor. Biol., 110: 275-297.

Pomiankowski, A., 1987. The costs of choice in sexual selection. J. Theor. Biol., 128: 195-218.

SAS Institute, 2001. SAS/STAT User's Guide Version 8.2 ed: Statistics. SAS Institute Inc., Cary, NC.

Scogin, V., G.C. Harris, R. Sellers Jr, J. Parker and K. Goto, 1982. Effects of environmental temperature, feeding program and body weight on semen production and certain blood parameters of broiler breeders. Poult. Sci., 61: 1395 (Abstract).

Siegel, P.B. and E.A. Dunnington, 1990. Reproductive complications associated with selection for broiler growth. In: Hill, W.G., J.M. Manson and D. Hewitt, editors. Poultry Genetic and Breeding. Br. Poult. Sci. Symp., 18.

Soller, M. and S. Rappaport, 1971. The correlation between growth rate and male fertility and some observations on selecting for male fertility in broiler stocks. Poult. Sci., 50: 248-256.

Wilson, H.R., N.P. Piesco, E.R. Miller and W.G. Nesbeth, 1979. Prediction of the fertility potential of broiler breeder males. World's Poult. Sci. J., 35: 95-118.

Zeller, F.J., 1971. The effect of testosterone and dihydrotestosterone in the comb, testes, and pituitary gland of the male fowl. J. Reprod. Fertil., 25: 125-127.

Zongo, D. and M. Petitjean, 1990. Effects associated with the Na (naked neck) gene in the domestic cock. I. live weight, comb, haematocrit, sexual maturity and semen characters in temperature environment. Bull. Anim. Health and Prod. in Af., 38: 259-263.

Zuk, M., T. Kim, S.I. Robinson and T.S. Johnson, 1998. Parasites influence social rank and morphology, but not mate choice, in female red jungle fowl, Gallus gallus. Ani. Behav., 56: 493-499.

Zuk, M., S.L. Pompa and T.S. Johsen, 1995. Courtship displays, ornaments, and female mate choice in captive red jungle fowl. Behav., 132: 821-836.