Ann. Génét. Sél. anim., 1979, 12 (2), 201-207.

Genetic correlation between length of wattles and female body weight at sexual maturity in the foul

H. AYOUB, M. F. AMER and S. SHALASH

Faculty of agriculture
Ain-shams university, Cairo, Égypt.

Summary

Two breeds (*White Plymouth Rock* and *Light Sussex*) and their F_1 crosses were used in this experiment in order to estimate phenotypic and genetic correlations between female body weight and their length of wattles at sexual maturity. Heritability estimates showed that both characters are highly influenced by heredity. The mean estimate of genetic correlation between the two characters was 0.19.

Introduction

Secondary sexual characters were proved to be correlated with egg productions and age at sexual maturity: PASVOGEL *et al.* (1951), PASVOGEL (1952) and GALPERN and BONGAIEV (1966).

AYOUB and MERAT (1975) proposed length of wattles of cockerels at 10 weeks of age as a criterion of selection for age at sexual maturity and egg production of their sisters. They obtained heritability estimates for the same trait.

The aim of this study is to estimate heritability of length of wattles for females at sexual maturity in other strains and genetic correlation between female body weight and this trait.

Material and methods

This experiment was carried out at Barrage, a Research Station belonging to the Agriculture Research Centre — Egyptian Ministry of Agriculture. Two seasons were available, namely 1974-75 and 75-76, using two pure breeds; *white Plymouth Rock* (*PP*), *Light Sussex* (*SS*) and their recriprocal Crosses. Sixteen sires were used, 8 sires from each strain. Each sire was mated to equal numbers

of dams from each strain in order to produce the two pure breeds and their reciprocal crosses.

Body weight and length of wattles were recorded for females at sexual maturity (22 weeks on the average). The data used in the analysis were as follows (Table 1).

Genetic correlations were obtained from sire and dam: components of covariance estimated on full — and half-sisters.

TABLE I

Numbers of sires, dams and offspring

Season	Strain	PP	SS	PS	SP
74-75	Sires	8	8	8	8
	Dams	36	38	42	28
	Offsprings	177	168	221	167
75-76	Sires	8	8	8	8
	Dams	27	31	36	27
	Offsprings	121	129	159	148

Results and discussion

1. — *Means and variances*

Means, standard deviations and coefficients of variation are presented in table 2, for each genetic group, and each character at sexual maturity.

a) *Body weight of females:*

Body weight of the crosses were intermediate between parental breeds but closer to the heavier (PP). These findings suggest that mature body weight is depending largely on additive genes, with some degree of heterosis. Moreover, the two crosses showed less variability than the two pure breeds involved in this study, which is in agreement with many available references.

b) *Length of wattles:*

The length of wattles followed the same trend as found for mean body weight. The two crosses were approximately intermediate between the two parental breeds suggesting the important role of additive genes in the inheritance of wattle size.

TABLE 2

Means, standard deviations and coefficients of variation for female body weight and length of wattles at sexual maturity

Character	Strains and crosses	1974-75			1975-76		
		$\bar{X}$	SD	C.V. (%)	$\bar{X}$	SD	C.V. (%)
Body weight at sexual maturity	PP	1 962.3	209.0	10.65	1 982.2	169.8	8.6
	SS	1 697.5	198.8	11.71	1 726.3	173.5	10.0
	PS	1 912.8	164.4	8.59	1 908.0	144.3	7.6
	SP	1 929.8	172.0	8.91	1 937.0	131.4	6.8
Length of wattles	PP	26.2	4.1	15.6	24.3	4.0	16.3
	SS	16.4	4.5	27.6	15.9	3.4	21.1
	PS	22.8	4.0	17.5	22.0	3.8	17.1
	SP	24.6	3.3	13.4	22.7	3.8	16.7

2. — *Phenotypic correlations*

Correlations between female body weight and length of wattles at sexual maturity are presented in table 3.

The estimates ranged from 0.12 to 0.62, suggesting a positive and significant correlation between the two characters.

TABLE 3

Phenotypic correlations between female body weight and length of wattles at sexual maturity

System of mating	Correlation	
	1974-1975	1975-1976
PP	0.34**	0.63**
SS	0.62**	0.55**
PS	0.43**	0.30**
SP	0.12*	0.38**

(**) = Significant at 1 p. 100 level; (*) = Significant at 5 p. 100 level.

3. — *Heritabilities*

a) *Body weight at sexual maturity:*

Heritability estimates were obtained for the same two traits and are presented in table 4. With respect to body weight they are within the range of many available references (KINNEY, 1969). In general, heritabilities based on dams components of variance were greater than those obtained by sires components of variance. This may be due the presence of non additive genetic variance or maternal effect involved in the inheritance of body weight at sexual maturity.

b) *Length of wattles:*

Heritability estimates of length of wattles are comparable with the estimates found by AYOUB and MERAT (1975) for the length of wattles at 10 weeks of age. Estimates from dam components of variance were generally greater than sire components of variance. These results confirm that length of wattles is appreciably influenced by heredity, although on the whole the heritability of this traits seems to be somewhat lower than that of body weight at the same age.

TABLE 4

Heritability estimates of female body weight and length of wattlesat sexual maturity

Character	System of mating	1974-74			1975-76			Pooled		
		S	D	(S + D)	S	D	(S + D)	S	D	(S + D)
Body weight at sexual maturity	PP	— 0.63	0.88	0.42	0.55	0.29	0.42	0.10	0.72	0.41
	SS	— 0.25	1.31	0.53	0.53	0.35	0.44	— 0.01	0.97	0.48
	PS	0.33	0.82	0.57	0.07	0.99	0.53	0.21	0.88	0.54
	sp	0.59	0.81	0.70	0.27	0.85	0.56	0.43	0.83	0.63
	Mean	0.16	0.95	0.56	0.36	0.62	0.49	0.18	0.85	0.52
Length of wattles	PP	0.12	0.31	0.21	0.49	0.34	0.42	0.24	0.32	0.28
	SS	0.20	0.50	0.35	0.13	0.40	0.26	0.15	0.46	0.30
	PS	0.28	0.74	0.51	— 0.03	0.59	0.28	0.13	0.69	0.41
	SP	0.39	0.36	0.37	0.60	0.17	0.38	0.46	0.26	0.36
	Mean	0.25	0.48	0.36	0.30	0.38	0.34	0.25	0.43	0.34

TABLE 5

Genetic correlation between female body weight and lenght of wattles at sexual maturity

System of mating	1974-75			1975-76			Pooled		
	S	D	S + D	S	D	S + D	S	D	S + D
PP	(1)	— 0.05	— 0.24	1.31	— 0.28	0.71	0.96	— 0.09	0.16
SS	(1)	0.58	0.45	0.56	— 0.12	0.26	(1)	0.57	0.40
PS	1.23	0.29	0.56	(1)	— 0.18	0.07	1.69	0.12	0.40
SP	— 0.21	— 0.02	0.26	0.26	— 0.54	— 0.10	0.07	— 0.45	— 0.19
MEAN	0.26	0.20	0.17	0.53	— 0.28	0.24	0.68	0.04	0.19

(1) Unestimated due to the negative values of sire components of variance.

4. — *Genetic correlations*

Genetic correlations are presented in table 5. Regarding the mean estimates being 0.17 in 1974-75, 0.24 in 1975-76 and 0.19 from the pooled estimates, it may be stated that there was a positive correlation between mature body weight of females and their length of wattles in agreement with the phenotypic correlation. The negative values of genetic correlations may be due to sample error or scaling effect (FALCONER, 1960). The higher value generally found for the sire component may correspond to the action of sex-linked genes.

Received for publication in august 1980.

Résumé

Corrélation génétique entre la longueur des barbillons et le poids des femelles à leur maturité sexuelle chez la poule

Deux races (*Plymouth Rock blanche* et *Sussex*) et leurs croisements F_1 ont été utilisés pour estimer l'héritabilité du poids corporel et de la longueur des barbillons des femelles à maturité sexuelle et leur corrélation phénotypique et génétique. Les estimations d'héritabilité sont appréciables. La valeur moyenne trouvée pour la corrélation génétique entre les deux caractères est 0.19.

Références

AYOUB H., MÉRAT P., 1975. Taille de la crête ou des barbillons des coquelets à 10 semaines, comme indice de maturité sexuelle dans la sélection pour la ponte. *Ann. Genet. Sel. Anim.*, **7**, 191-196.

GALPERN I., BONGAIEV G. I., 1966. *Appréciation précoce des qualités de reproduction et de production.* Publ. Minist. Agric. U.R.S.S., Moscou, Colos.

FALCONER D. S., 1960. *Introduction to quantitative genetics.* Oliver and Boyd, London.

KINNEY T. B., 1969. A summary of report estimates of heritability of genetic and phenotypic correlation for traits of chickens. *Agri. Handbook* 363, Agric. Res. Service, USDA.

PASVOGEL M. W., 1952. *Correlation between the egg laying ability of pullets and certain hormonally controlled characteristics of the full brothers.* Ph. D. Thesis, University of Illinois.

PASVOGEL M. W., NALBANDOV A. V., MORTON H. W., 1951. Relationship between comb growth in the male and egg production in the sibs. *Poult. sci.*, **30**, 926 (abstr.).