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The Phenotypic Correlations Among Body Weights, Body Measurements and Carcass Traits in Some Purebreds of Chickens and Their Crosses

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THE PRESENT study was carried out at the Poultry Breeding Research Station in El-Qanater , Animal Production Research Institute, Ministry of Agriculture . Two exotic breeds of chickens namely New Hampshire (NH) and White Plymouth (WP) and two native breeds namely Dandarawi (DN) and Silver Montazah (SM) , were used in a 4x4 diallel crossing experiment. A total number of 2413 chicks were included in the present study to estimate the phenotypic correlations among body weight , body measurements at different ages as well as carcass traits at 20 weeks of age .

All estimates of phenotypic correlations were significantly positive ($p<0.01$) and high in magnitude. The estimates ranged between 0.42 and 0.91 among body weights; 0.60 and 0.90 among body measurements; 0.42 and 0.93 between body weights and measurements and 0.29 and 0.99 among carcass traits. The high and positive phenotypic correlations obtained in the present study lead to conclude that phenotypic selection carried out at earlier ages may be effective for producing a chick characterized with high growth rate , fast feathering and good carcass traits .

Most reviewed estimates of phenotypic correlations for body weights and for body measurements were highly significantly correlated with each other. According to Falconer (1989), significant and positive phenotypic correlations between two weights or measurements do not necessarily indicate that selection on one of these traits will lead to an improvement in the other; because the phenotypic correlation is not always a reliable estimate of the genetic relationship existing between two traits. This means that an environmental effect upon the two traits, could be strongly positively correlated and at the same time the negative genetic correlation is masked.

The aim of the present study is to estimate the phenotypic correlations among body weights, body measurements and carcass traits in some purebreds of chickens and their crosses.

Material and Methods

This experiment was carried out at the Poultry Breeding Research Station in El-Qanater , Animal Production Research Institute , Ministry of Agiculture. Four breeds of chickens were used in this experiment , two exotic breeds namely New Hampshire (NH) and White Plymouth (WP) , and two native breeds , Dandarawi (DN) and Silver Montazah (SM). The mating design was planned in a complete diallel mating 4x4 to get purebred and crossbred progenies. Two hatches were produced in the period from November 1985 to June 1986. Detailed description of the material , management , breeding plan and statistical analysis was reported by Hanafi *et al* . (1991) .

Data on body weights (BW) of 2413 birds over two hatches were taken at 2, 4, 6, 8, 12, 16 and 20 weeks of age . Body measurements taken were length (BL) , circumference (BC) and depth (BD) and shank length (SL) at 4, 8, 12 and 16 weeks. Carcass traits for 524 chicks representing all breed-groups were included in this study. Detailed description of carcass traits was explained by Khalil *et al* . (1991) .

The data were analysed using Harvey `s Least - Squares and Maximum likelihood Computer Program (Harvey , 1987) . Accordingly , the phenotypic correlations (adjusted for all non-genetic effects included in the model) were estimated .

Results and Discussion

Phenotypic correlations among body weights

The phenotypic correlations between body weights at different ages are presented in Table 1 . It can be noticed that correlations at most ages were positive , and highly significant ($p<0.01$) and of high magnitude. Those estimates ranged between 0.42 and 0.91 with an average of 0.69 . It is clear also that the coefficients of the phenotypic correlation tended to decrease in value as the differences between the two ages increased. For example ,the correlation between 2-week body weight and each of 4, 6, 8 and 12 weeks of age were 0.73 , 0.67 , 0.66 and 0.64 with an average of 0.68 , while those between 2-week body weight and each of 16 and 20 weeks of age were 0.48 and 0.42 with an average of 0.45. This could be attributed to that the gene expression decreases in its effect as the differences between the two ages increased. Verma *et al.* (1978) and Singh *et al.* (1988) came to the same conclusion and reported that the phenotypic correlations between body weights at different ages were positive and generally high in magnitude and tended to decrease in value as the differences between the ages increased. However , estimates of the present and reviewed studies indicated that selection for improving body weight at later ages could be carried out through selection at early ages .

Phenotypic correlations among body measurement

Table 2 presents the coefficients among the different body measurements. The results showed also that the correlations between the different body measurements were positive and high in magnitude and ranged between 0.60 and 0.90 with an average of 0.76. The phenotypic correlations among each of BL , BD, BC, SL and the other body measurements over all ages averaged 0.77, 0.76, 0.77 and 0.75, respectively. The interpretations for the coefficients of phenotypic correlation of body weights are valid for body measurements .

Phenotypic correlations among body weights and measurement

It can be seen from Table 3 that correlations between body weights and measurements were positive and highly significant ($p<0.01$) . The esimates of the phenotypic correlations between body weight and each of BD , BC, BL and SL over all ages averaged 0.72, 0.74 , 0.73 and 0.72 respectively , and they tended to value as the differences between the two ages increased. Similarely , Abdel Gawad and El-Ibiary (1972), Zaidan (1977) and Verma *et al* . (1979) reported that body weights were positively highly correlated ($p<0.01$) with SL at different ages. Also Andrews (1972); El-Attar (1977) and Farrag (1977) confirmed the previous results in terms of correlation between body weight and body depth . Those high correlations between body weights and measurements may be attributed to the pleiotropic effect of the genes and / or linkage effect and consequently performing phenotypic selection in any of the two traits will lead to an improvement in the other trait .

TABLE 1. The phenotypic correlations* among body weights at different ages.

Body weight	2 Weeks	4 Weeks	6Weeks	8Weeks	12 Weeks	16 Weeks
4 Weeks	0.73					
6 Weeks	0.67	0.81				
8 Weeks	0.66	0.78	0.90			
12 Weeks	0.64	0.73	0.83	0.91		
16 Weeks	0.48	0.54	0.63	0.67	0.75	
20 Weeks	0.42	0.50	0.59	0.65	0.73	0.62

* All estimates were highly significant (P<0.01).

TABLE 2. The phenotypic correlations * among different body measurements at different ages.

Body measure-ments	BL			BD			BC			SL		
	4wks	8wks	12wks	4wks	8wks	12wks	4wks	8wks	12wks	4wks	8wks	12wks
BL:												
8 Weeks	.76			.77			.78			.72		
12 Weeks	.72	.85		.71	.83		.71	.85		.68	.82	
16 Weeks	.67	.80	.88	.61	.74	.80	.64	.77	.83	.61	.74	.82
BD:												
8 Weeks	.76			.78			.78			.73		
12 Weeks	.72	.87		.72	.88		.72	.89		.69	.84	
16 Weeks	.67	.81	.85	.62	.79	.88	.64	.80	.86	.62	.78	.84
BC:												
8 Weeks	.76			.77			.78			.76		
12 Weeks	.71	.87		.70	.88		.71	.90		.69	.86	
16 Weeks	.67	.82	.87	.63	.78	.86	.63	.81	.88	.60	.78	.85
SL:												
8 Weeks	.72			.75			.75			.73		
12 Weeks	.69	.80		.69	.82		.70	.83		.71	.85	
16 Weeks	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 3. The phenotypic correlations* between body weights and body measurements at different ages.

Body measurements	Body weights						
	2 Weeks	4 Weeks	6 Weeks	8 Weeks	12 Weeks	16 Weeks	20 Weeks
BD:							
4 Weeks	0.71	0.79	0.77	0.76	0.71	0.52	0.46
8 Weeks	0.65	0.75	0.86	0.91	0.86	0.65	0.59
12 Weeks	0.63	0.72	0.79	0.87	0.91	0.69	0.69
16 Weeks	0.57	0.62	0.71	0.77	0.84	0.70	0.72
BC:							
4 Weeks	0.72	0.79	0.77	0.88	0.69	0.50	0.42
8 Weeks	0.67	0.77	0.88	0.93	0.88	0.66	0.63
12 Weeks	0.64	0.72	0.79	0.88	0.93	0.71	0.71
16 Weeks	0.58	0.60	0.75	0.80	0.87	0.86	0.71
BL:							
4 Weeks	0.73	0.79	0.78	0.76	0.70	0.50	0.42
8 Weeks	0.63	0.74	0.86	0.89	0.84	0.63	0.60
12 Weeks	0.65	0.72	0.79	0.87	0.91	0.68	0.65
16 Weeks	0.60	0.67	0.77	0.82	0.87	0.73	0.71
SL:							
4 Weeks	0.72	0.79	0.77	0.75	0.69	0.51	0.42
8 Weeks	0.60	0.74	0.86	0.89	0.84	0.64	0.63
12 Weeks	0.62	0.69	0.81	0.87	0.92	0.70	0.70
16 Weeks	0.57	0.63	0.72	0.79	0.86	0.72	0.72

* All estimates were highly significant ($P<0.01$).

Correlations among carcass traits

It is clear from the results presented in Table 4 that all the estimates of correlation were positive and highly significant ($P<0.01$) between live body weight and carcass traits at 20 weeks of age. Estimates ranged between 0.63 and 0.98. Also very high estimates were observed between live weight and each of dressed and eviscerated weights (0.98). Thus, it is expected that heavy live weight will give heavy carcass weight. Also live weight was highly correlated with feather weight (0.63) . So, an early and fast feathering bird will be associated with high growth rate and consequently , heavy carcass weight will be obtained. Similar results were found by Siegel and Essary , 1959; Abdou ; 1964 Souri *et al* ., 1972 ; Singh *et al* ., 1977 and Kumar and Acharya, 1980 . They reported that correlations between body weights and their eviscerated and dressed weights at slaughter were positive and of high magnitude (P<0.01). These results are due to their partwhole relationship.

TABLE 4. The phenotypic correlations* for body weight and carcass traits at 20 weeks of age.

Trait **	LW	HSF	DW	EW	G	V	B
HSF	0.70						
DW	0.98	0.65					
E	0.98	0.65	0.99				
G	0.68	0.45	0.67	0.64			
V	0.65	0.31	0.55	0.54	0.44		
B	0.75	0.43	0.72	0.72	0.51	0.50	
F	0.63	0.29	0.55	0.55	0.37	0.43	0.52

* All estimates were highly significant (P<0.01).
** Lw = Preslaughter live body weight;
HSF = Head + Shank + Feet; DW=Dressed weight;
EW = Eviscerated weight; G=Giblets; B=Blood and F=Feather.

The correlations between the dressed weight and each of the eviscerated weight (0.99) and giblet weight (0.67) were positive and high in magnitude. This may be attributed to that the eviscerated weight represents the greatest part of the dressed weight. Correlations between viscera weight and each of alive weight, dressed weight and eviscerated weight were high; 0.65, 0.55 and 0.54, respectively. This may be due to that viscera represent the different physiological functions of body systems and that may be the main reason for the high efficiency of metabolism and growth gained. The high correlations between blood and each of alive weight (0.75) and carcass traits (0.65) , may be due to the high efficiency of blood circulation and consequently , high efficiency of feed absorption and metabolism.

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صفات الذبيحه وبعضها وبين ٦٣ر. الى ١٩٨ر.

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