Genetic study on Dandarawy chickens. II. Heritability of live and carcass measurements

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Original article

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Summary — Data on live and carcass measurements were collected from 314 male *Dandarawy* chicks (Egyptian strain) from 33 sires and 157 dams using 2 full-sibs per dam. They were weighed, keel and shank length being recorded, and then slaughtered at 12 and 16 weeks of age (one progeny per dam at each age). Carcass weight was recorded. Dressing and giblet percentages were calculated as percentages of the live body weight. The means of live and carcass measurements indicated that our local strain *Dandarawy* had lower values than the meat type of fowls (broilers). The heritability estimates for weight and length measurements ranged from 0.6 to 1.3 calculated from the sire component of variance, but the estimates were very low and not significant for the dressing and giblet percentages. Those estimates indicated the possibility of improving weight and length measurements by individual selection. The phenotypic correlations between 12 and 16 weeks of age were significant for all the traits except the dressing and giblet percentages.

***Dandarawy* chicken – carcass – heritability – phenotypic correlation**

Résumé — Etude génétique de la race egyptienne de poulets *Dandarawy*. II. Héritabilité des mesures sur le vivant et des mesures de carcasse. *Des mesures sur l'animal vivant et sur la carcasse ont été faites sur 314 poussins mâles de la race égyptienne* Dandarawy *issus de 33 pères et 157 mères (deux poussins par mère). Les mesures sur le vivant étaient le poids corporel, la longueur de la patte et la longueur du bréchet avant l'abattage. Les poussins ont été abattus à l'âge de 12 et 16 semaines (un descendant par mère et par âge). Le poids de la carcasse et les pourcentages de carcasse et d'abats consommables par rapport au poids vif ont été enregistrés. Les moyennes calculées montrent que la souche* Dandarawy *est de plus petite taille que les souches étrangères. Les estimations des héritabilités à partir de la composante père varient de 0,6 a 1,3 pour les mesures de poids et de longueur. Par contre, les estimations obtenues pour le pourcentage de carcasse et d'abats consommables ont une valeur faible. Ces résultats montrent qu'il est possible d'améliorer par sélection massale les mesures de poids et de longueur. Les corrélations phénotypiques entre 12 et 16 semaines d'âge sont significatives pour toutes les mesures sauf les pourcentages de carcasse et d'abats consommables.*

poulet* Dandarawy – *carcasse* – *héritabilité* – *corrélation phénotypique

Introduction

Development of broiler strains in Egypt is still facing a great deal of difficulty owing to the lack of genetic information about the local breeds of chickens which should be available

before such a programme is undertaken. The present study was undertaken primarily to estimate some genetic parameters on live and carcass measurements in one of the Egyptian local strains, namely *Dandarawy*, in order to determine certain recommendations to be used in a programme designed for improving this strain. Sharara (1974) indicated that the mean body weights in *Dandarawy* chickens were 419 and 636 g at 12 and 16 weeks of age, and that the body conformation in *Dandarawy* was better than in *Fayoumi* chickens at 12 and 16 weeks of age. Ricard (1980) showed that the live body weight, keel length, shank length and dressing percentage were 1488 g, 10.1 cm, 10.8 cm and 61.7% respectively in the broiler chickens (Cornish x White Rock cross) at 8 weeks of age.

Although several workers have reported heritability estimates for body weight at different ages, no such information is available for the carcass measurements of the Egyptian strains. The present study involves estimating the heritability for the live and carcass measurements at the ages of 12 and 16 weeks in order to assess the possibility of selection for improved production of meat in *Dandarawy* chickens at an early age. Phenotypic correlations between 12 and 16 weeks of age are also estimated for these traits.

Regarding heritability estimates for live and carcass measurements of certain foreign strains, Kinney (1969) summarized published reports on heritability for those traits in chickens which ranged from 0.40 to 0.58 for body weight and 0.41 for dressing percentage, estimated from the sire component of variance. Muir and Goodman (1964) showed that the heritability estimate of dressing percentage from the sire component of variance was 0.12, but Goodman (1973) indicated that it was 0.62 and 0.28 for live body weight and dressing percentage, respectively, from the sire component of variance. Ricard (1974) found estimates of 0.45 and 0.33 for live body weight and dressing percentage in a medium sized strain, respectively.

In the paper of Kinney (1969), the heritability estimates for shank and keel length ranged from 0.04 to 0.59 from the sire component of variance, whereas Merritt (1966) showed that heritabilities estimated from the sire component of variance were 0.43 and 0.35 respectively for males. Moreover, Ricard (1974) reported estimates of 0.62 and 0.64 for keel and shank length, respectively.

Estimates of phenotypic correlation of body weight and carcass quality at different ages were given by Martin *et al.* (1953), Merritt (1966) and Ricard (1980); they reported a highly significant correlation between carcass yield and body conformation, but Goodman (1973) showed a low phenotypic correlation between body weight and dressing percentage from full-sib components of covariances and variances.

Materials and Methods

Animals

Three hundred and fourteen chicks (males) were obtained from 33 sires and 157 dams, with 2 full-sibs per dam from a random-bred population of *Dandarawy* maintained at the Poultry Farm of Assiut University. From one day to 16 weeks of age, all chicks were reared on the floor and fed *ad libitum* on a commercial ration containing 18% total protein and 2800 kcal/kg.

One full-sib from each dam was slaughtered at 12 and 16 weeks of age after a period of 16 h starvation from feed only. Live body weight, keel and shank length were recorded before slaughtering, these forming the live measurements. The eviscerated carcass (after removal of the 2 shanks, all the viscera and the abdominal fat and the head) and giblets (heart, liver and gizzard) were weighed for all individuals to the nearest gram. Dressing percentages and giblet percentages were calculated as a percentage of the live body weight.

Statistical methods

Heritability was estimated from the sire component of variance according to the formula:

$$h_s^2 = \frac{4\,\sigma_s^2}{\sigma_s^2 + \sigma\,\omega^2}$$

where σ_s^2 estimates 1/4 of the additive genetic variance, 1/16 of the additive x additive genetic variance and various amounts of the sex linkage variance; $\sigma\omega^2$ estimates the remainder of the genetic variance plus all the environmental variance (Becker, 1975). The phenotypic correlation was estimated from the formula:

$$r = \frac{\mathrm{cov}\,(xy)}{\sqrt{\sigma_x^2 \cdot \sigma_y^2}}$$

where x and y are the measurements at 12 and 16 weeks of age for the 2 full sibs; cov (xy) estimates 1/2 additive variance, 1/4 dominance variance and all the common environmental variances; σ_x^2 and σ_y^2 estimate the total variances of the 2 measurements at 12 and 16 weeks of age (Falconer, 1981).

Results

The means and standard deviations of live and carcass measurements at 12 and 16 weeks of age are given in Table I. The dressing and giblet percentages were 62 – 65 and

Table I. Means (± SD) for the various traits.

Traits	*12 weeks*	*16 weeks*
Live body weight (g)	721.1 ± 133.8	964.9 ± 173.4
Shank length (cm)	8.7 ± 0.6	10.0 ± 0.8
Keel length (cm)	8.2 ± 0.6	8.9 ± 0.8
Carcass weight (g)	448.7 ± 93.8	631.6 ± 121.3
Dressing percentage	62.2 ± 3.8	65.1 ± 2.5
Giblets percentage	5.7 ± 0.6	5.5 ± 0.6

Table II. Heritability estimates (± SD) from the sire components of variance and phenotypic correlations at 12 and 16 weeks of age for the traits studied.

Traits	*12 weeks*	*16 weeks*	*Phenotypic correlation*
Live body weight (g)	0.83 ± 0.30	1.27 ± 0.31	0.28*
Shank length (cm)	0.58 ± 0.28	0.81 ± 0.29	0.26*
Keel length (cm)	0.59 ± 0.28	0.95 ± 0.30	0.26*
Carcass weight (g)	0.83 ± 0.30	1.26 ± 0.31	0.29*
Dressing percentage	−0.17 ± 0.18	−0.05 ± 0.20	0.18
Giblets percentage	0.06 ± 0.22	0.43 ± 0.26	− 0.02

* Significant at the 5 percent level.

5.5%, respectively. This result showed that ≈ 67 – 70% of the live weight is consumable in *Dandarawy* chickens.

The heritability estimates (Table II), showed that the body weight, shank and keel length and carcass weight had high values at 12 and 16 weeks of age, but both dressing and giblet percentages had low and non-significant values.

The phenotypic correlations between 12 and 16 weeks of age (Table II of the 2 full-sibs for all the traits studied showed significant correlations for the majority of the traits, except those concerning the dressing and giblet percentages.

Discussion

The means of live body weight at 12 and 16 weeks of age were obviously lower than those well known in broilers at slaughtering time, as mentioned by Ricard (1980). However, the shank and keel length and dressing percentages were near those of the meat type of fowl, but still lower than that type (Merritt, 1966; Ricard, 1980). The difference between our result and results cited in the literature was attributed to the differences between our strain and the other foreign breeds and to the technique of evisceration which differs from one laboratory to another.

Heritability estimates (Table II) were quite high for weight and length measurements at 12 and 16 weeks of age. The estimates of heritability contained one-quarter of the additive genetic variance and various amounts of additive x additive and sex-linked variances (Merritt, 1966; Becker, 1975). Two heritability values at 16 weeks of age exceeded unity; such values are obviously abnormal and suggest the presence of variation other than additive genetic variance. The heritability values estimated from the sire components of variance for live weight, shank and keel length had the same trend as those mentioned by Merritt (1966), Kinney (1969), Goodman (1973) and Ricard (1974). Heritability estimates of the dressing and giblet percentages were lower than those for the other traits at 12 and 16 weeks of age. Similar results were reported by Muir and Goodman (1964) and Merritt (1966). The heritability estimates of both dressing and giblet percentages in *Dandarawy* chickens were lower than those reported by Goodman (1973) and Ricard (1974). Such high estimates of heritability for live and carcass measure-

ments pointed to the possibility of improving those traits in *Dandarawy* chickens through individual selection. Goodman (1973) and Ricard (1974) reported the possibility of improving meat production by selection.

The phenotypic correlations between 12 and 16 weeks of age (Table II) of the 2 full-sibs were low, but statistically significant for body weight and body conformation traits at 12 and 16 weeks of age. Aman and Becker (1983) reached a similar conclusion. The correlations of both dressing and giblet percentages estimated from the 2 full-sibs were not significant. This result was in agreement with that mentioned by Goodman (1973).

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