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# GENETIC AND PHENOTYPIC PARAMETERS OF CARCASS CHARACTERISTICS IN GIZA RABBITS

*By*

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The present work was carried out during 1965-1966 season on Giza rabbits from the experimental Farm of the Animal and Poultry Breeding Department, Faculty of Agriculture, Cairo University, Giza, Egypt, U.A.R. Slaughter tests were done on 251 males at 90 days of age. Heritability, genetic and phenotypic correlations were estimated for the carcass characteristics. The main results obtained are summarisd in the following.

The average body weight and carcass weight at the age of 90 days of age were 994.93 and 451.50 grams respectively. The percentage of carcass weight to live body weight was 45.80% at 90 day of age.

The hind quarter represented the highest ratio of the actual weight, followed in order by breast + shoulders, loin and head.

The heritability estimates of eviscerated weight, head weight, breast weight, loin weight and hind quarters weight were all in the neighbourhood of zero.

The genetic and phenotypic correlations between body weight, eviscerated weight and all the components of the carcass were found to be high and positive.

It is concluded that selection on eviscerated weight basis will positively affect the carcass parts in general.

The phenotypic characteristics of the Giza breed of rabbits, originally bred by the Animal Breeding Department, Faculty of Agriculture, Giza, have been thoroughly studied. Yet only few reports are available on the genetic structure of this breed. Since the main purpose of raising rabbits is meat production and certain genetic parameters have to be calculated for any scheme of genetic improvement in this direction, this investigation has been carried out to calculate the nesessary parameters for the improvement of meat yield.

By carcass characteristics it is meant the absolute weights of the different parts (head, breast, loin and hind quarters) of the slaughtered animals and their percentage to thelive or eviscerated weight. These characteristics are subjected to the influence of age, sex, live weight and breed. (Wilson and Morris, 1932, Huxley, 1932, Hammond, 1932, Fangauf and Immenkamp, 1938, Wilson and Mccartney, 1940, Palken and Antipin, 1946, Kheir El-Din, 1950, and Hanafi, 1959).

## Materials and methods

This work was carried out in the poultry Research Center, Faculty of Agriculture, Cairo University, Giza, during the season 1965–1966, using the Giza, breed of rabbits. Parturitions took place from October 1965 till March 1966. The number of parents used through the breeding season was 124 does and 26 bucks. Both males and females were kept sepatate in wooden wine-notted hutches.

The rabbits were fed three times daily, the morning meal was usually composed of clover hay. Berseem (*Trifolium alexandrinum*) was offered at mid day. The evening meal ration consisted of 50 % barely and 30% wheat bran. In summer, green Corn-stock replaced berseem.

Slaughter tests sure deus only on male progeny at the age of 90 days. Altchl number of 251 males was tested. The live meight of each rabbit was recorded before slaughter. Skinning was carried out by removing the skin attached to the fore-feet, hind quarters and tail. After recording the weight of the empty carcass it was out into four parts, and each part was weighed alone. The first out was made at the neok, separating the head from the body. The second cut was made just behind the last rib, separating the breast and shoulders. The third cut was performed at the pelvis, separating the loin region from the thirds. The last cut consists of the hind quarters.

## Methods of Analysis

A.—*Estimating heritabilities* :

Applying the method discribed by Falconer (1961) for estimating the heritability by full and half sib analysis, it was found that all the sire estimates ($h^2_s$) were negative.This may be due to the small number used in this study (the average number of progeny per dam was very low) and for the presence of a large contribution of maternal effects and dominance variance. It was decided then to work only on a between and within sires basis, *i.e.*. the between dams item was dropped. Again $\sigma^2_d$ was assumed to be equal to $\sigma^2_s$ in the expected mean squares (E.M.S.) and thus the E.M.S. within sires was assumed to be equal to $\sigma^2_w + \frac{k_1(d-s)}{n-s}\sigma^2_d$. The E.M.S. between sires will be equal to $\sigma^2_w + k_2\sigma^2_d + k_3\sigma^2_s$ where :

$\sigma^2_w$ = Variance due to differences between individuals.
$\sigma^2_s$ = Variance due to differences between sires
d = Number of dams.
S = Number of sires.
n = total number of offspring.
$k_1$ = the coefficient of dam component in the M.S. within sires.
$k_2$ = the coefficient of dam component in the M.S. between sires.
$k_3$ = the coefficient of sire component in the M.S. between sires.

B.—Estimating the genetic and phenotypic correlations.

The genetic and phenotypic correlations were estimated according to the farmulae given by Falconer (1961). The same methods for estimating heritability were adopted to estimate the genetic correlations between the different traits.

## Results and discussions

The average weight of the body, carcass and its different parts in Giza rabbits are given in Table 1.

TABLE 1.—MEANS OF TRAITS STUDIED

| Items | Weight in grams | ±S.E. |
|---|---|---|
| Live weight . . . . . | 994.93 | ±16.64 |
| Eviscerated weight . . . . | 451.50 | ± 8.60 |
| Head weight . . . . . | 70.50 | ± 0.68 |
| Breast weight . . . . . | 143.39 | ± 2.94 |
| Loin weight . . . . . | 75.45 | ± 1.92 |
| Hind-quarters . . . . . | 157.86 | ± 3.12 |
| Fur weight . . . . . | 78.19 | ±1.77 |

S.E. = Standard error.

This table shows that the average body weight at 90 days of age was 994. 93 grams. This estimate is almost the same as that reported for the same breed, by Kheir El-Din (1950) at this age (1019.. 60 grams). However, Choniem *et al.* (1958) reported a lower average of 539.60 grams for body weight at the same age.

The results show that the heaviest part of the carcass was the hind quarters, followed by the breast, loin and head "table 2". Accordingly they constitute, in this same order the highest relative weights with respect to the carcass (table 2). This agrees with the results reported by Kheir El-Din (1950) and Hanafi (1959).

The ratio of eviscerated weight to live body weight was 45.82 %. This percentage is lower than that obtained by Hanafi (1959), whose estimate was 48.90%

TABLE 2.—RELATIVE WEIGHT OF CARCASS TO LIVE WEIGHT AND RELATIVE WEIGHTS OF BODY PARTS TO THE CARCASS WEIGHT AND LIVE WEIGHT IN GIZA RABBITS AT 90 DAYS OF AGE

| Items | Mean weight in grams | % to live weight | % to Eviscerated weight |
|---|---|---|---|
| Live weight . . . . . | 994.93 | 100 | — |
| Eviscerated weight . . . . . | 451.50 | 45.82 | 100 |
| Head weight . . . . . | 70.50 | 7.16 | 15.61 |
| Breast weight . . . . . | 143.39 | 14.55 | 31.35 |
| Loin weight . . . . . | 75.45 | 7.65 | 16.71 |
| Hind-quarters weight . . . . . | 157.86 | 16.02 | 34.96 |
| Fur weight . . . . . | 78.19 | 7.93 | 17.31 |

*Heritabilities, genetic and phenotypic correlations:*

Table 3 shows the heritability estimates of body weight and its components at 12 weeks of age. The heritability of body weight was found to be .030. The estimates of heritability for all the carcass parts were very low. The heritability of eviscerated weight at 12 weeks of age, head weight, breast weight, loin weight, hind quarters weight and fur weight lie all in the neighbourhood of zero. However, the picture cannot be completed without the discussion of the interrelationships between these parts.

The genetic and phenotypic correlations between body weight, and eviscerated weight and the component of the carcass were found all to be high and positive except for head weight and loin weight which were relatively small (table 4). The same table shows that the genetic correlations were always higher than the phenotypic correlations except for head weight and loin weight in which the phenotypic correlations were higher. This may indicate that the genetic selection for body weight will increase the carcass weight and its components, and only to a smaller extent will it increase the weights of the head and loin.

The phenotypic correlations between eviscerated weight and its components were all very high (all estimates near one). The genetic correlations were also very high except for head weight and breast weight, whose estimates of genetic correlations with eviscerated weight were 0.625 and 0.570 respectively.

TABLE 3.—ESTIMATES OF VARIANCE COMPONENTS AND HERITABILITIES OF CARCASS PARTS

| Traits | $\sigma^2_s$ | $\sigma^2_w$ | $h^2$ |
|---|---|---|---|
| Live body weight | 584.59 | 76519.38 | 0.030 |
| Eviscerated weight | 23.65 | 20356.33 | 0.004 |
| Headweight | 3.15 | 127.64 | 0.096 |
| Breast weight | 1.60 | 2415.10 | 0.002 |
| Loin weight | 0.31 | 1032.40 | Zero |
| Hind-quarters weight | 4.39 | 2901.99 | 0.006 |
| Fur weight | 1.99 | 880.10 | Zero |

$K_1 = 2.01$ $K_2 = 2.05$ $K_3 = 9.62$ D.F. = 250.

TABLE 4.—CORRELATIONS BETWEEN THE WEIGHT OF CARCASS PARTS

| Traits | Live body weight | Eviscerated weight | Head weight | Breast weight | Loin weight | Hind quarters weight | Fur weight |
|---|---|---|---|---|---|---|---|
| Live Body weight | — | 1.000** | .106 | 1.000 | .046 | 1.000 | .773 |
| Eviscerated weight | .875 | — | .625 | .570 | 1.000 | 1.000 | 1.000 |
| Head weight | .432 | .977 | — | .396 | .595 | .338 | .503 |
| Breast weight | .953 | .989 | .964 | — | .706 | 1.000 | .608 |
| Loin weight | .402 | .996 | .926 | .912 | — | .852 | .613 |
| Hind quarters weight | .897 | .995 | .934 | 1.000 | .954 | — | 1.000 |
| Fur weight | .679 | 1.000 | 1.000 | .998 | .897 | 1.000 | — |

Figures on above diagonal represnet genetic correlations.
Figures under diagonal represent phenotypic correlations.
** Figures were considered to be 1 if the calculated correlation was more than that.

Table 3 shows that the genetic variance of eviscerated weight $4\sigma^2_s$ is equal to 94.6 $gm^2$. The sum of the genetic variances of its four components is equal to 37.8 $m^2$. This indicates that most of the variance of aviscerated weight is expressed as covariances between its components, and thus giving rise to the high genetic correlations between the carcass parts. In other words it may be assumed that most of the genes affecting carcass weight as a whole have influences on all its components.

In pigs, Cupka (1961) found that the phenotypic correlation coefficient between eye muscle area and weight of neck and cutlet was 0.44 and between eye muscle area and weight of lean meat was 0.41. The foregoing discussion indicates that genetic and phenotypic selection for eviscerated weight will result in increasing the weight of every part of it, different result compared to the selection on body weight as such.

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# المؤشرات الوراثية والمظهرية فى صفات الذبيحة فى ارانب الجيزة أبيض

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## الملخص

تبين من نتائج هذا البحث أن متوسط الوزن الحى عند عمر ٩٠ يوما كان ٩٣ر٩٩٤ جم ووزن الذبيحة ٥٠ر٤٥١ جم ونسبة التصافى ٨٠ر٤٥٪ وقد ساهمت الأرباع الخلفية بأكبر نسبة من الذبيحة يليها الصدر والاكتاف ثم القطن وأخيرا الرأس .

وكانت القيمة الوراثية لوزن الذبيحة والرأس والصدر والقطن والأرباع الخلفية كلها حوالى الضعف .

كما أن معاملات التلازم الوراثى والبينى بين وزن الجسم الحى ووزن الذبيحة وكذلك مكونات الذبيحة الأخرى كانت قيمة عالية وايجابية مما يبعث على القول بأن الانتخاب تبعا لنسبة التصافى عموما سوف ينتج زيادة فى الأجزاء المكونة للذبيحة .