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# RELATION AND INTERRELATION BETWEEN BODY WEIGHTS AND GROWTH RATES OF CATTLE AND BUFFALOES AT SOME DIFFERENT AGES OF LIFE.

*By*

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SUMMARY

A statistical analysis was carried out on the weight records of the two herds, one of Egyptian cattle, and an other of buffaloes belonging to the Animal Breeding Department, Faculty of Agriculture, Cairo University.

Records used in this work were collected over a period of 22 years (1933 - 1955). The data comprised 107 males, 126 females of Egyptian cattle, and 107 males, 108 females of buffaloes.

Correlation coefficients between birth weight and weights at 6 months as well as between this weight and body weight at 12 months, body weight at 12 months and at 18 months, body weight at 18 months and at 24 months were significant and of positive values. They were 0.3067, 0.7499, 0.8316, and 0.8516 for males of cattle, and 0.2579, 0.6296, 0.7299, and 0.7727 for females of cattle, and 0.3975, 0.6960, 0.8629, and 0.8028 in males of buffaloes, and 0.4595,0.7087, 0.7532, and 0.8629 in females of buffaloes respectively.

In females of cattle and buffaloes there was only significant correlation coefficients between the nonsuccessive body weights $Wt_0$ and $Wt_{12}$, $Wt_0$ and $Wt_{18}$ of 0.2441, and 0.3299 in cattle, and 0.3467, and 0.2792 in buffaloes respectively.

The correlation coefficient between birth weight and $R_5$, $Wt_4$ and $R_2$, $Wt_6$ and $R_3$, $Wt_{12}$ and $R_4$, $Wt_{18}$ and $R_5$ were -0.3927, 0.1597, 0.3411, and 0.6175 in males of cattle, and 0.3271, 0.1834, 0.2466, 0.4641 and 0.4932 in females respectively. In the case of buffaloes the same correlation coefficients were 0.5356, 0.2426, 0.3178, 0.5471, and 0.3219 for males, and 0.4327, 0.1143, 0.3743, 2140 for fe0.0566, and 0.males respectively.

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## INTRODUCTION

The weight which any animal attains at a certain stage of life is the outcome of interaction between its genotype and the environmental conditions prevailing during such period of time. Usually, the differentiation between fast and slow growing animals is either represented in live weight or in growth rate terms. The relation between these two features as well as between the successive performances of each of them when clearly known, adds to the yardsticks the breeder needs to depend upon for selecting fast growing animals.

Posticularly, both Egyptian cattle and buffaloes need to be improved in these two aspects whether for their future as dairy animals or as a source for meat by-product. Their economy of meat production is questioned especially with the ever increasing prices for concentrates.

In this work the relation and interrelationship between body weights and growth rates of cattle and buffaloes at the different ages of life were studied.

## MATERIAL AND METHOD

The same material previously described by Ragab & Abd El-Salam (1962) was used. Also statistical procedure followed was that given by Snedecor (1956).

## RESULTS AND DISCUSSION

A.—*Relationship between weights and relative growth rates* :

Tables 1, 2, 3, and 4 comprise the correlation coefficients between body weights at birth 4, 6, 12, and 18

months. On one hand and the succeeding relative growth rates $R_1$, $R_2$, $R_3$, $R_4$ and $R_5$ on the other. Body weights at 4, 6, 12, 18 and 24 months of age were also correlated to the anteceeding relative growth rates $R_1$, $R_2$, $R_3$, $R_4$, and $R_5$. The regression values of the relative growth rates on weights and weights on relative growth rates are given in the previous tables for males and females of Egyptian cattle and buffaloes.

It is observed that all correlation coefficients between body weights of the different ages and the preceding relative growth rates were negative, while they were positive between weights and the anteceding relative growth rates. The "b" values of relative growth rates on the anteceding weights were also negative, but they were positive for weights on anteceding relative growth rates.

In males of both Egyptian cattle and buffaloes, birth weight was found to be highly and negatively correlated with $R_1$ being —0.3927 and —0.5356, respectively (Tables 1, and 3).

The relation between $Wt_4$ and $R_2$ in males of cattle was highly significant, and negative in correlation as "r" value was —0.3970, but in case of buffaloe males it was —0.3426. This correlation coefficient between $Wt_4$ and $R_2$ was significant in buffaloes. (Tables 1, 3).

$Wt_6$ had no significant influence on $R_3$ in males of cattle and buffaloes.

There were highly significant correlation coefficients —0.3411, and 0.5471 between $Wt_{12}$ and $R_2$ in males of cattle and buffaloes respectively. $Wt_{18}$ and a highly significant negative correlation coefficient with $R_5$ being —0.6175 for males of cattle, $Wt_{18}$ and no influence on $R_5$ in males of buffaloes since no significant correlation was found between the two items. (Tables 1, 3).

Regression values of relative growth rates on weights were —1.34 for $R_1$ on $Wt_6$, —0.3223 for $R_2$ on $Wt_4$, —0.085

for $R_3$ on $Wt_6$, 0.090 for $Wt_{12}$, and 0-.114 for $R_5$ on $Wt_{18}$ in males of cattle. (Table 1).

In the case of males in buffaloes regressions were -1.112 for $R_1$ on $Wt_0$, -0.191 for $R_2$ on $Wt_4$, -0.143 for $R_3$ on $Wt_6$, 0.115 for $R_5$ on $Wt_{12}$, and -0.041 for $R_5$ on $Wt_{18}$ (Table 3).

It is noticed, therefore that with the increase of age, relative growth rates decreased by the increase of the antecdeng body weight.

The relationship between birth weight and $R_1$, $Wt_4$ and $R_2$ were definite and negative, i.e. weights were correlated significantly to relative growth rates untill the age of b months, indicating the existence of two periods of growth during the 2 years of age in males of Egyptian cattle and buffaloes, the second begins at the age of 12 months.

In females of Egyptian cattle and buffaloes (Tables 2, 3) $Wt_0$ had a highly significant negative correlation of -0.3271 and -0.5327 with $R_1$ in cattle and buffaloes respectively.

$Wt_4$ had no influence on $R_2$ in both cattle and buffaloes, females since no significant correlation coefficient was found between the two items.

$Wt_6$ had a highly significant negative correlation coefficient with $R_3$ being -0.2466 and -0.3743 for females of cattle and buffaloes respectively.

$Wt_{12}$ and $R_4$ as well as $Wt_{18}$ and $R_5$ both had highly significant negative correlation coefficients being -0.4641, and 0.4932 in cattle females respetively. There was no significant correlation between the same weights and relative growth rates in females of buffaloes.

Regression values of relative growth rates on anteceding weights in cattle females were -1.360 for $R_1$ on Wt.0, -0.118 for $R_2$ on $Wt_4$, -0.114 for $R_3$ on $Wt_6$, -0.157 for $R_4$ on $Wt_{12}$, and -0.109 for $R_5$ on $Wt_{18}$. (Table 2).

In the case of females of buffaloes regression values were 1.062 for $R_1$ on $Wt_0$, -0.148 for $R_2$ on $Wt_3$, -0.171 for $R_3$ on $Wt_6$, -0.017 for $R_3$ on $Wt_{12}$ and -0.034 for $R_4$ on $Wt_{18}$. (Table 4).

The relation between weights and relative growth rates in females followed the same trend previously found in case of males. This was also observed in the case of the regression of relative growth rate on anteceding weights.

It seems also that there are two periods of fast growth in females as well as in males, but the second period in the case of females seems to begin earlier than in males as it begins at the age of 4 months compared to 6 months in the case of males.

The relations between weights and growth rates obtained in this study are all of a phenotypic nature. Therefore, such relation could not be used for selection purposes, and genotypic analysis must be carried out.

B.—*Interrelationship between body weights at the different ages :*

Tables 5, 6, 7, and 8 comprise the correlation coefficients between body weights at birth, 6, 12, 18, and 24 months of age. Also the average correlation coefficient between all these items is given. This coefficient is the repeatability for body weight for males and females in Egyptian cattle and buffaloes. It is observed that all correlation coefficients between body weights at the different ages were positive, except between $Wt_0$, $Wt_{18}$, and $Wt_0$, $Wt_{24}$ in males of buffaloes which were not significant.

In males of Egyptian cattle, birth weight had only a significant influence on body weight at 6 months. The "r" value was 0.3067 . Afterwards the correlation coefficients were not significant when birth weight was correlated to the body weights at 12, 18, and 24 months of age (Table 5).

In the case of females, birth weight had a significant influence on body weights at 6, 12 and 18 months of age, the "r" values were 0.2579, 0.2441, and 0.3299 respectively (Table 6).

In the case of buffaloes, also the birth weight of males affected the body weight only at 6 months of age. The correlation between birth weight and live weight at 6 months was highly significant, and the "r" value was 0.3975 (Table 7).

Females of buffaloes had the same trend found in females of cattle. Birth weight had a significant influence on body weight at 6, 12, and 18 months of age. The "r" values were 0.4595, 0.3467, 0.2792 respectively (Table 8).

A significant positive correlation between birth weight and live weight at 6 months was found in both sexes of Egyptian cattle and buffaloes. This was similar to what was found by Gregory et al (1950), Veiga (1950) and Tantawi and Ahmed (1955).

In the case of Egyptian cattle and buffalo females, there were significant correlation coefficients when birth weight was correlated to the body weights at 12 and 18 months of age.

It was noticed in both Egyptian cattle and buffaloes that the relationship between the successive weights was much stronger than between the nonsuccessive weights, and it increased gradually as animals grew, while it decreased in the case of the nonsuccessive weights.

In the case of cattle, the correlation coefficients for body weights $Wt_0 \times Wt_6$, $Wt_6 \times Wt_{12}$, $Wt_{12} \times Wt_{18}$ and $Wt_{18} \times Wt_{24}$ were found to be 0.3067, 0.7499, 0.83516 for males, and 0.2579, 0.6296, 0.7299, 0.7727 for females of cattle respectively (Tables 8 and 9).

In buffaloes, the "r" values were 0.3975, 0.6960, 0.8629, and 0.8028 for males, and 0.4595, 0.7087, 0.7532 and 0.8629 for females respectively (Tables 7 and 8).

The averrage correlation coefficient between weights in males of cattle was 0.485, and 0.510 in buffaloes, compared to 0.530 and 0.635 in case of females of cattle and buffaloes respectively (Tables 5, 6, 7 and 8).

The repeatability of body weight was found to be higher in the buffaloes than in cattle. It was 0.508 for cattle and 0.573 for buffaloes.

TABLE 1. — The Relationships and Regression between Weights and Realtive Growth rates of Males in Cattle.

| Correlated items | No. of pairs | r value | b Y on X | b X on Y |
|---|---|---|---|---|
| $Wt_0 \times R_1$ | 77 | 0.3927** | —1.3399 | — |
| $Wt_4 \times R_1$ | 77 | 0.1267N.S. | — | 1.8154 |
| $Wt_4 \times R_2$ | 71 | 0.3970** | —0.3231 | — |
| $Wt_6 \times R_2$ | 71 | 0.3971** | — | 0.6443 |
| $Wt_6 \times R_3$ | 50 | 0.1597N.S. | —0.0849 | — |
| $Wt_{12} \times R_3$ | 50 | 0.5219** | — | 1.6698 |
| $Wt_{12} \times R_4$ | 35 | 0.3411** | —0.0897 | — |
| $Wt_{18} \times R_4$ | 35 | 0.0697N.S. | — | 0.3373 |
| $Wt_{18} \times R_5$ | 22 | 0.6175** | —0.1138 | — |
| $Wt_{24} \times R_5$ | 22 | 0.1234N.S. | — | 0.7724 |

** Highly significant.
N.S. : Not significant.
X : Body weight.
Y : Rate of growth.

TABLE 2.—The Relationship and Regression between Weights and Relative Growth Rates of Females in Cattle

| Correlated items | No. of pairs | r value | b of Y on Y | b of X on Y |
|---|---|---|---|---|
| $Wt_0 \times R_1$ | 106 | —0.3271** | —1.3598 | — |
| $Wt_4 \times R_1$ | 106 | 0.2998** | — | .3119 |
| $Wt_4 \times R_2$ | 94 | —0.1834 N.S. | — .1179 | — |
| $Wt_6 \times R_2$ | 94 | 0.3903** | — | .8167 |
| $Wt_6 \times R_3$ | 82 | —0.2466* | — .1438 | — |
| $Wt_{12} \times R_3$ | 82 | 0.3971** | — | 1.0729 |
| $Wt_{12} \times R_4$ | 81 | —0.4641 | — .1574 | — |
| $Wt_{18} \times R_4$ | 81 | 0.2334* | — | .8884 |
| $Wt_{18} \times R_5$ | 60 | —0.4932** | — 0.190 | — |
| $Wt_{24} \times R_5$ | 60 | 0.5694 | — | .2872 |

** : Highly significant.
* : Significant.
N.S. : Not significant.
X : Body weight.
Y : Growth rate.

TABLE 3.—The Relationships and Regression between Weights and Relative Gowth Rates of Males in Buffaloes.

| Correlated items | No. of pairs | r value | b of X on Y | b of X on Y |
|---|---|---|---|---|
| $Wt_0 \times R_1$ | 57 | —0.5356** | —1.1121 | — |
| $Wt_4 \times R_1$ | 57 | 0.3030** | — | .4216 |
| $Wt_4 \times R_2$ | 51 | —0.3426* | — 0.1909 | — |
| $Wt_6 \times R_2$ | 51 | 0.3676* | — | .8404 |
| $Wt_6 \times R_3$ | 35 | —0.3178 | — .01432 | — |
| $Wt_{12} \times R_3$ | 35 | 0.4111* | — | 1.3950 |
| $Wt_{12} \times R_4$ | 27 | —0.5471** | — 0.1151 | — |
| $Wt_{18} \times R_4$ | 27 | —0.0547 | — | —0.3076 |
| $Wt_{18} \times R_5$ | 17 | —0.3219 | — 0.409 | — |
| $Wt_{24} \times R_5$ | 17 | 0.1335 | — | 1.1782 |

** : Highly significant.
* : Significant.
X : Body weight.
Y : Growth rate.

TABLE 4.—The Relationship and Regression between Weights and Relative Growth rates of Females in Buffaloes.

| Correlated items | No. of pairs | r value | b of Y on X | b of X on Y |
|---|---|---|---|---|
| $Wt_0 \times R_1$ | 86 | —0.5327** | —1.0621 | — |
| $Wt_4 \times R_1$ | 86 | 0.6974** | — | .8979 |
| $Wt_4 \times R_2$ | 74 | —0.1443 | — .1477 | — |
| $Wt_6 \times R_2$ | 74 | 0.2197 | — | .4318 |
| $Wt_6 \times R_3$ | 55 | —0.3743** | — .1705 | — |
| $Wt_{12} \times R_3$ | 55 | 0.3469* | — | 1.0919 |
| $Wt_{12} \times R_4$ | 55 | —0.0566 | — .0165 | — |
| $Wt_{18} \times R_4$ | 55 | 0.6887** | — | 3.0286 |
| $Wt_{18} \times R_5$ | 49 | —0.2140 | — .0335 | — |
| $Wt_{24} \times R_5$ | 49 | 0.2100 | — | 1.6291 |

** : Highly significant.
* : Significant.
X : Body weight.
Y : Growth rate.

TABLE 5.—The Relationship between Weights of Males Cattle at Different Ages.

| Correlated items | No. of pairs | r value |
|---|---|---|
| $Wt_0 \times Wt_6$ | 77 | 0.3067 ** |
| $Wt_0 \times Wt_1$ | 50 | 0.0811 N.S. |
| $Wt_0 \times Wt_{18}$ | 40 | 0.1353 N.S. |
| $Wt_0 \times Wt_{24}$ | 27 | 0.0012 N.S. |
| $Wt_6 \times Wt_{12}$ | 50 | 0.7499 ** |
| $Wt_6 \times Wt_{18}$ | 38 | 0.6915 ** |
| $Wt_6 \times Wt_{24}$ | 26 | 0.2806 N.S. |
| $Wt_{12} \times Wt_{18}$ | 35 | 0.8316 ** |
| $Wt_{12} \times Wt_{24}$ | 25 | 0.6083 ** |
| $Wt_{18} \times Wt_{24}$ | 22 | 0.8516 ** |

** : Highly significant.
N.S. : Not significant.

TABLE 6.—The Relationship between Weight of Females at Different Ages in Cattle.

| Correlated items | No. of pairs | r value |
|---|---|---|
| $Wt_0 \times Wt_6$ | 95 | 0.2579 * |
| $Wt_0 \times Wt_{12}$ | 85 | 0.2441 * |
| $Wt_0 \times Wt_{18}$ | 76 | 0.3299 ** |
| $Wt_0 \times Wt_{24}$ | 60 | 0.1322 N.S. |
| $Wt_6 \times Wt_{12}$ | 82 | 0.6296 ** |
| $Wt_6 \times Wt_{18}$ | 74 | 0.7498 ** |
| $Wt_6 \times Wt_{24}$ | 54 | 0.6389 ** |
| $Wt_{12} \times Wt_{18}$ | 81 | 0.7299 ** |
| $Wt_{12} \times Wt_{24}$ | 62 | 0.7484 ** |
| $Wt_{18} \times Wt_{24}$ | 60 | 0.7727 ** |

* : Significant.
** : Highly xignificant.
N.S. : Not significant.

TABLE 7.—The Relationship between Weight of Males at Different Ages in Buffaloes.

| Correlated items | No. of pairs | r value |
|---|---|---|
| $Wt_0 \times Wt_6$ | 56 | 0.3975 ** |
| $Wt_0 \times Wt_{12}$ | 36 | 0.1062 N.S. |
| $Wt_0 \times Wt_{18}$ | 27 | —0.0612 N.S. |
| $Wt_0 \times Wt_{24}$ | 16 | —0.1593 N.S. |
| $Wt_6 \times Wt_{12}$ | 36 | 0.6960 ** |
| $Wt_6 \times Wt_{18}$ | 27 | 0.5174 ** |
| $Wt_6 \times Wt_{24}$ | 16 | 0.4807 N.S. |
| $Wt_{12} \times Wt_{18}$ | 27 | 0.8629 ** |
| $Wt_{12} \times Wt_{24}$ | 16 | 0.8360 ** |
| $Wt_{18} \times Wt_{24}$ | 17 | 0.8028 ** |

** : Highly significant.
N.S. : Not significant.

TABLE 8.—The Relationship Between weights of Females at Different Ages in Buffaloes.

| Correlated items | No. of pairs | r value |
|---|---|---|
| $Wt_0 = Wt_6$ | 79 | 0.4595 ** |
| $Wt_0 = Wt_{12}$ | 64 | 0.3467 ** |
| $Wt_0 = Wt_{18}$ | 62 | 0.2792 * |
| $Wt_0 = Wt_{24}$ | 52 | 0.1010 N.S. |
| $Wt_6 = Wt_{12}$ | 59 | 0.7087 ** |
| $Wt_6 = Wt_{18}$ | 53 | 0.9475 ** |
| $Wt_6 = Wt_{24}$ | 44 | 0.4914 ** |
| $Wt_{12} = Wt_{18}$ | 57 | 0.7532 ** |
| $Wt_{12} = Wt_{24}$ | 46 | 0.7456 ** |
| $Wt_{18} = Wt_{24}$ | 51 | 0.8629 ** |

* : Significant.
** : Highly significant.
N.S. : Not signif.cant.

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# ملخص

## العلاقات المتبادلة بين وزن الجسم ومعدل النمو فى الماشية المصرية والجاموس فى بعض مراحل العمر المختلفة

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درست العلاقة بين هاتين الظاهرتين فى قطيعين أحدهما من الجاموس والآخر من الأبقار المصرية بمزرعة كلية الزراعة — جامعة القاهرة — شملت ١٠٧ ذكراً، ١٢٦ أنثى من الماشية وكذلك ١٠٧ ذكراً، ١٠٨ أنثى من الجاموس.

وحسبت معاملات التلازم بين الأوزان عند الميلاد والأوزان فى عمر ستة شهور و١٢ شهراً و١٨ شهراً و٢٤ شهراً على التوالى فوجد أنها موجبة ومعنوية من الناحية الإحصائية وكانت هذه المعاملات هى ٣٠٧٦ر، ٧٤٩٩ر، ٨٣١٦ر لذكور الماشية مقابل ٢٥٧٩ر، ٦٢٩٦ر، ٧٢٩٩ر، ٧٧٢٧ر للأناث أما فى الجاموس فكانت ٣٩٧٥ر، ٦٩٦٠ر، ٨٦٢٩ر، ٨٠٢٨ر للذكور مقابل ٤٥٩٥ر، ٧٠٨٧ر، ٧٥٣٢، ٨٦٢٩ر للأناث.

هذا وكان معامل التلازم بين الوزن عند الميلاد والوزن عند ١٢ شهراً هو ٢٤٤١ر، كما كان هذا المعامل بين الوزن عند الميلاد والوزن عند ١٨ شهراً ٣٢٩٩ر فى أناث الأبقار ولم يكن لها دلالة إحصائية معنوية وكذلك كانت معاملات التلازم فى أناث الجاموس بين الوزن عند الميلاد والوزن عند ١٢ شهراً ٣٤٦٧ر مقابل ٢٧٩٢ر بين الوزن عند الميلاد والوزن عند ١٨ شهراً وهذه أيضاً لم تكن ذات دلالة إحصائية معنوية.

أما معاملات التلازم بين الوزن عند الميلاد ومعدل النمو فى الفترة الأولى والوزن عند أربعة شهور ومعدل النمو فى الفترة الثانية وكذلك الوزن عند ستة شهور ومعدل النمو فى الفترة الثالثة والوزن عند ١٢ شهراً ومعدل النمو فى الفترة

الرابعة وكذلك الوزن عند ١٨ شهراً ومعدل النمو فى الفترة الخامسة فقد كانت — ٣٩٢٧ر ، ٣٩٧٠ر ، ١٥٩٧ر ، ٣٤١١ر ، ٦١٧٥ ر فى ذكور الماشية مقابل ٣٢٧١ر ، ١٨٣٤ر ، ٤٦٤١ر ، ٤٩٣٢ر فى أناثها أما فى الجاموس فقد كانت معاملات التلازم للظواهر السابقة ٥٣٥٦ر، ٣٤٢٦ر، ٣١٧٨ر ، ٥٤٧١ر ، ٣٢١٩ فى الذكور مقابل ٥٣٢٧ر ، ١١٤٣ر ، ٣٧٤٣ر، ٠٥٦٦ر، ٢١٤٠ر للأناث على التوالى .