

## MEAT PRODUCTION AND GROWTH STUDIES OF DIFFERENT BREEDS AND CROSSES OF CHICKENS FED ON CERTAIN LEVELS OF NUTRITION

By

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### SUMMARY

A comparative study of meat production and growth measure among the local breeds, the foreign breed "Rhode Island Red" (R.I.R.) and its crosses with the local breeds was undertaken. The initial total number of chicks used was 1523 ranging between 88-299 in the different breeds and crosses. The study continued up to 28 weeks old. Results show that the gain in weight per 4 weeks interval increases gradually and reaches a maximum at the interval 16-20 weeks old, then it decreases gradually. The growth measure increases gradually up to the interval 16-20 weeks old, after which it rises suddenly, therefore the economic period of growth for meat production should not exceed the age of 20 weeks for chickens. It is recommended to slaughter the extra birds at that age keeping the necessary ones for breeding stock. The average total gain for cockerels is always higher than that of pullets. The increase in gain is 20.4% in the local breeds, 32.6% in the 50% cross breeds of R.I.R., 33.9% in the 75% cross breeds and 50.3% in R.I.R. It is noticeable that the average total gain in weight for the local breeds is the least. The average total gain for the 50% cross breeds of R.I.R. is higher than that of the corresponding local breeds, while it is less than both the 75% cross breeds and the R.I.R. Relative to local breeds, the average total gain for the 50% cross breeds of R.I.R. is 23.8% higher than in the case of pullets and 36.4% higher than in the case of cockerels. In case of pullets the average total gain in weight for the 75% cross breeds of R.I.R. is 52.5% higher than the corresponding local breeds and 23.2% higher than the corresponding 50% cross breeds of R.I.R., while in case of cockerels it is 69.6% higher than the former and 24.4% higher than the latter. The average total gain in weight for R.I.R. is the highest among all the experimental breeds and crosses of both pullets and cockerels. The average growth measure for cockerels is always less than that of the pullets. It is 16.3% less in the local breeds, 30.7% in the 50% cross breeds of R.I.R., 27.9% in the 65% cross breeds and 36.1% in R.I.R. It is noticeable that the average growth measure for the local breeds is the highest, while for the 50% cross breeds of R.I.R. it is less than that of the corresponding local breeds and more than both the 75% cross breeds and R.I.R. Relative to local breeds, the average growth measure for the 50% cross breeds of R.I.R. is 19.2% less in case of pullets and 28.9% less in case of cockerels. The average growth measure for the 75% cross breeds is 34.8% less than the corresponding local breeds and 19.3% less than the corresponding 50% cross breeds of R.I.R., while in case of cockerels it is 43.8% less than the former and 21.0% less than the latter. The average growth measure for R.I.R. is generally the lowest among all the experimental breeds and crosses.

## INTRODUCTION

As the food is the major item of expenses in poultry production, it was necessary to undertake a comparative study of meat production and growth among the local breeds, the foreign breed Rhode Island Red which was preferred to other breeds, and its crosses with the local breeds.

Previous studies (1) with different crosses of foreign breeds and local ones (males of Rhode Island Red, Light Sussex, Brown Leghorn and Legbar with females of the local breeds) the 50% cross breed of R.I.R. was found to be superior in egg production. In addition this foreign breed was more acclimatized in the Experimental Station of Animal Nutrition, Faculty of Agriculture, Giza, showed more resistance to disease and bred more successfully than the other foreign breeds. Greater number of this foreign breed was available at the farm, and therefore it was more suitable for experimental designs.

Comparative studies using certain suitable level of nutrition already known from previous work on economic feeding of poultry (1) revealed the differences among the different fowls in growth and in the efficiency of utilizing feed.

## EXPERIMENTAL AND METHODS

### *Experimental Birds*

The study included the local breeds : Baladi Red, Baladi White and Fayoumi, the pure breed Rhode Island Red, the 50% and 75% cross breeds of the R.I.R. with the local breeds.

The initial total number of chicks used in the study was 1523 ranging between 88-299 in the different breeds and crosses. The experiment started from the hatching day and closed at 28 weeks old.

### *Management*

After hatching, chicks were kept in warm houses, warm water was offered, No mash was offered to one day old chicks. They received sand to facilitate crushing food later in the gizzard. Charcoal powder was also offered to absorb harmful gases.

From the 2<sup>nd</sup> to the 7<sup>th</sup> day, Chicks received five meals of a mash consisting of wheat and maize grains coarsely milled ; green fodder (Egyptian clover), sand, charcoal powder and warm water were also offered. The mash was left to be eaten *ad libitum*, usually for a period not exceeding one hour.

In the second week, chicks received a mash consisting of milled wheat (50%), maize (30%) and fine bran (20%) mixed with skim milk (30 ml/100 gm. mash) as a source of animal protein, green fodder, sand and charcoal powder were also offered. The mash was offered in the same manner as before.

During the 3rd and 4th weeks chicks received a transitional ration 3 times daily *ad libitum*. The ration was a mixture of the previous mash and the experimental dry ration which was used from the 5th to the 28th week.

*Rations given during the experimental period*

Two experimental rations were offered, one for the local breeds and crosses (Ration A) and the other for the pure breed (Ration B), as shown in table (1). The food was offered twice daily at 8.00 and 14.00 hrs.

TABLE 1.—The formula of the experimental rations for growth

Ingredients	Ration A	Ration B
	%	%
Corn (maize) . . . . .	15	15
Barley . . . . .	15	15
Wheat bran . . . . .	22.5	25
Rice bran . . . . .	22.5	—
Horse beans . . . . .	—	20
Undecorticated cottonseed cake . . . . .	25	25
Total . . . . .	100	100
Meat meal added to 100 parts of the ration . . . . .	2.0	3.5
Lime (calcium carbonate) added to 100 parts of the ration . . . . .	1.5	1.5
Salt (sodium chloride) added to 100 parts of the ration . . . . .	0.5	0.5
% digestible protein in the whole mixture . . . . .	12.4	15.5
Starch equivalent in the whole mixture . . . . .	65.5	65.7

Sufficient vitamins were supplied by offering green maize (Darawa) during summer or green berseem (*Trifolium alexandrinum*) during winter. The green fodder was equal in weight to the daily mash offered to birds.

*Starch equivalent consumed per chick*

Chicks were offered daily different amounts of starch equivalent according to their age as shown in Table (2).

TABLE 2.—Average daily ration offered for chicken during the successive weekly intervals and the starch equivalent consumed

Age in weeks	Ration A		Ration B	
	Amount offered per chicken/day (gm.)	Starch equivalent consumed/chicken every 4 weeks	Amount offered per chicken/day (gm.)	Starch equivalent consumed/chicken every 4 weeks
5 - 7	20		24	
7 - 9	25	413	30	497
9 - 11	35		42	
11-13	45	734	55	901
13-15	55		65	
15-17	65	1100	75	1288
17-19	70		85	
19-21	80	1376	95	1656
21-23	90		110	
23-24	100	1742	120	2116
24-28	100	1834	120	2208

*Methods of interpreting results*

The mixed birds (pullets and cockerels) were weighed at 4 weeks intervals from one day old up to 12 weeks. At the 12th week it was possible to separate pullets from cockerels in local and cross breeds but with the R.I.R. this was possible only at 16 weeks old. Both pullets and cockerels were then weighed separately until the birds were 28 weeks old.

The starch equivalent consumed per chicken was calculated during the experimental period at 4 weeks intervals. This would enable us to know the amount of starch equivalent required for one unit live weight increase during the successive intervals of growth, *i.e.*, to calculate the "growth measure".

Such study is of practical importance, as it would be a guide to know the differences in the growth measures and the feeding-cost if the unit starch equivalent of the feeding mixture is known.

For comparison, the relative weight to that of hatching weight was calculated assuming the hatching weight to be 100.

The growth rate was also studied at 4-weeks intervals, by obtaining the weight gained every successive 4-weeks.

The "relative growth rate percentage" was also studied. The following equation used by Ghoneim *et al* (1) was used for calculation :

$$100 \times \frac{\text{Weight at the end of interval} - \text{weight at the beginning of the interval}}{\text{Weight at the beginning of the interval}}$$

It represents the amount of growth gained per 100 unit of the live weight during 4 weeks.

## RESULTS AND DISCUSSION

### Comparative study of the meat production and growth measure among different breeds and crosses

Table (3) shows the average gain in weight of birds at 28 weeks old and the average growth measure during the period 4-28 weeks.

#### (a) Average gain in weight

It is noticeable from Table (3) that the average gain in weight was the least for the local breeds : Baladi Red, Baladi white and Fayoumi for both pullets and cockerels. The range was 792.9-973.4 grams for pullets and 807.9-1223.4 grams for cockerels. The average gain in weight for the three local breeds was 890.1 grams for the former and 1071.4 grams for the latter. Among the local breeds the average gain in weight for Baladi Red was the lowest being 792.9 grams for the pullets and 807.9 grams for the cockerels, while it was the highest for Baladi white being 973.4 grams for the former and 1223.6 grams for the latter respectively.

The average gain in weight for the cockerels was more than that for the corresponding pullets being 20.4% more.

The average gain for the 50% cross breeds of the R.I.R. was more than that of the corresponding local breeds, while it was less than both the 75% cross breeds of the R.I.R. and the pure R.I.R.

TABLE 3.—Average gain in weight and growth measure among different breeds and crosses

Breeds	Average gain in weight (0-28 weeks)				Growth measure (4-28 weeks)			
	Absolute in grams		Assuming the lowest = 100		Absolute in kg.		Assuming the highest = 100	
	Female	Male	Female	Male	Female	Male	Female	Male
Baladi red . . . . .	792.9	807.9	100.0	100.0	10.284	9.957	100.0	100.0
Baladi white . . . . .	973.4	1223.4	122.8	151.4	8.199	6.383	79.7	64.1
Fayoumi . . . . .	904.0	1184.0	114.0	146.6	8.999	6.666	87.5	66.9
(R.I.R. × Baladi red) . . . . .	1010.3	1294.3	127.4	160.2	8.060	6.115	78.4	61.4
(R.I.R. × Baladi white) . . . . .	1086.4	1405.4	137.0	174.0	7.425	5.587	72.2	56.1
(R.I.R. × Fayoumi) . . . . .	1208.4	1683.4	152.4	208.4	6.718	4.655	65.3	46.8
R.I.R. × (R.I.R. × Baladi red) . . . . .	1252.2	1842.2	157.9	228.0	6.672	4.313	64.9	43.3
R.I.R. × (R.I.R. × Baladi white) . . . . .	1412.8	1842.8	178.2	228.1	5.542	4.164	53.9	41.8
R.I.R. × (R.I.R. × Fayoumi) . . . . .	1406.6	1766.6	177.4	218.7	5.713	4.444	55.6	44.6
Rhode Island red . . . . .	1471.0	2211.0	185.5	273.7	6.620	4.229	64.4	42.5

The range was 1010.3-1208.4 grams for the pullets and 1294.3-1683.4 grams for the cockerels. The average gain in weight was 1101.7 grams for the former and 1461.0 grams for the latter respectively.

Among the 50% cross breeds of the R.I.R. the average gain in weight for (R.I.R. × Baladi Red) was the lowest being 1010.3 grams for the pullets and 1294.3 grams for the cockerels, while it was the highest for (R.I.R. × Fayoumi) being 1208.4 grams for the former and 1683.4 grams for the latter. The average gain for the cockerels was in general 32.6% more than that for the pullets.

Relative to the local breeds, the average gain for the 50% cross breeds of the R.I.R. was 23.8% more in case of pullets and 36.4% more in case of cockerels.

The average gain in weight for the 75% cross breeds of the R.I.R. was more than both the corresponding local breeds and the 50% cross breeds, while it was less than that of the foreign breed R.I.R. The range was 1252.2-1412.8 grams for the pullets and 1766.6-1842.8 grams for the cockerels. The average gain in weight for the 75% cross breeds of the R.I.R. was 1357.2 grams for the former and 1817.2 grams for the latter.

Among the 75% cross breeds of the R.I.R. the average gain for R.I.R. × (R.I.R. × Baladi Red) was the lowest in case of pullets being 1252.2 grams and R.I.R. × (R.I.R. × Fayoumi) was the lowest in case of cockerels being 1766.6 grams.

The average gain in weight for the cockerels was in general 33.9% more than that of the pullets.

The average gain in weight for the 75% cross breeds of the R.I.R. was 52.5% more than the corresponding local breeds and 23.2% more than the corresponding 50% cross breeds of the R.I.R. in case of pullets and 69.6% more than the former and 24.4% more than the latter in case of cockerels.

The average gain in weight for the foreign breed R.I.R. was the highest among all the experimental birds for both pullets and cockerels.

The average gain for the cockerels was 50.3% more than that of the pullets. The average gain in weight was 65.2%, 33.5% and 8.4% more than local breeds, 50% cross breeds and 75% cross breeds respectively in case of pullets and was 106.4%, 51.3% and 21.7% more in case of cockerels.

#### (b) *Growth measure*

From table (3) it appeared that the growth measure for the local breeds was the highest. The range was 10.384-8.199 kg. for the pullet, and 9.957-6.383 kg. for cockerels.

The average growth measure for these three local breeds was 9.161 kg. for the former and 7.668 for the latter. Among the local breeds, the growth measure for Baladi Red was the highest being 10.284. for the pullets and 9.957 kg. for the cockerels, while Baladi White was the lowest being 8.199 kg. for the former and 6.382 kg. for the latter.

The average growth measure for the cockerels of the local breeds was in general 16.3% less than that for the pullets.

The average growth measure for the 50% cross breeds of R.I.R. was less than that for the corresponding local breeds, which was more than both the corresponding 75% cross breeds and the pure foreign breed. The average was 8.060 - 6.718 kg. for the pullets and 6.115 - 4.655 kg. for the cockerels. The average growth measure for these three 50% cross breeds was 7.401 kg. for the former and 5.453 kg. for the latter.

Among the 50% cross breeds of R.I.R. the growth measure for (R.I.R. × Baladi Red) was the highest being 8.060 kg. for the pullets and 6.115 kg. for the cockerels, while (R.I.R. × Fayoumi) was the lowest being 6.718 kg. for the former and 4.655 kg. for the latter. The average growth measure for the cockerels of the 50% cross breeds was in general 30.7% less than that of the pullets. The average growth measure was 19.2% and 28.9% less than the corresponding local breeds in case of pullets and cockerels respectively.

The average growth measure for the 75% cross breeds of R.I.R. was less than both local breeds and the 50% cross breeds, while it was nearly equal to that of the foreign breed R.I.R. The range was 6.672 - 5.542 kg. for the pullets and 4.444 - 4.164 kg. for the cockerels. The average growth measure for these three 75% cross breeds was 5.976 kg. for the former and 4.307 kg. for the latter. The growth measure for these 75% cross breeds of R.I.R. was nearly equal among each sex, while it was higher in case of pullets than cockerels. The average growth measure for the cockerels was in general 27.9% less than that for the pullets. The average growth measure for these 75% cross breeds of R.I.R. was in general 34.8% and 19.3% less than both the corresponding local breeds and the 50% cross breeds in case pullets and 43.8% and 21.0% less in case of cockerels respectively.

The average growth measure for the foreign breed R.I.R. was generally the lowest among all the experimental birds especially in case of cockerels. The average growth measure for the cockerels was 36.1% less than that for the pullets. The average growth measure for the foreign breed R.I.R. was 27.7% and 10.6% less than both the corresponding local breeds and 50% cross breeds respectively in case of pullets and was 44.8% and 22.4% less in case of cockerels, while it was nearly equal to that of the 75% cross breeds.



From the previous studies it can be concluded that generally the average gain in weight of all the cockerels of the different breeds used in this work was 32.5% more than the pullets.

The growth measure of cockerels was 23.9% less than that of the pullets.

In general the birds of the different breeds and crosses could be arranged according to the average growth measure (and this is of economical importance) starting from the highest, it would be as follows :

Pullets	Cockerels
Baladi red . . . . .	Baladi red .
Fayoumi . . . . .	Fayoumi.
Baladi white . . . . .	Baladi white
(R.I.R. × Baladi red) . . . . .	(R.I.R. × Baladi red)
(R.I.R. × Baladi white) . . . . .	(R.I.R. × Baladi white)
(R.I.R. × Fayoumi) . . . . .	(R.I.R. × Fayoumi).
R.I.R. × (R.I.R. × Baladi red) . . . . .	R.I.R. × (R.I.R. × Fayoumi).
Rhode Island red . . . . .	R.I.R. × (R.I.R. × Baladi red)
R.I.R. × (R.I.R. × Fayoumi) . . . . .	Rhode island red
R.I.R. × (R.I.R. × Baladi white) . . . . .	R.I.R. × (R.I.R. × Baladi white).

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## النمو وانتاج اللحم من انواع وخطان مختلفة مفذاة على علائق مختلفة

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### الملخص

قدمت لطيور هذه التجربة عليقتان أساسيتان بعد فترة التدرج ، الأولى كانت تحتوى على ٦٥٥٪ معادل نشا ، ١٢ر٤٪ بروتين كلى مهضوم وأعطيت هذه العليقة للدجاج البلدى والخليط ، وأعطى الدجاج الأجنبى عليقة تحتوى على ٦٥٧٪ معادل نشا ، ١٥٥٪ بروتين كلى مهضوم وذلك علاوة على المادة الخضراء والأملاح المعدنية .

ومن نتائج هذه التجارب أن مقدار النمو يتزايد تدريجيا كل ٤ أسابيع من ابتداء التجربة حتى الفترة ١٦ - ٢٠ أسبوعا وهي عبارة عن الفترة الاقتصادية للنمو حيث أن مقياس النمو أخذ في الانخفاض تدريجيا بعد هذه الفترة .

ومن نتائج هذه التجارب أيضا أن سرعة الديوك في جميع السلالات كانت أسرع من الإناث بمقدار يتراوح ما بين ٢٠ر٤٪ الى ٥٠ر٣٪ كما لوحظ أن الدجاج الأجنبى كان أسرع الطيور نموا في حين أن الدجاج البلدى أقلها سرعة في النمو .

ومن نتائج هذه التجارب أيضا أن مقياس النمو في الديوك أقل دائما منه في الإناث فكان يقل بنسبة تتراوح ما بين ١٦ر٣٪ ، ٣٠ر٧٪ ، ٢٧ر٩٪ ، ٣٦ر١٪ للدجاج البلدى وخليط ٥٠٪ وخليط ٧٥٪ والأجنبى على التوالى .

وقد لوحظ أيضا أن مقياس النمو في الدجاج الخليط ٥٠٪ يقل عنه في الدجاج البلدى بمقدار ١٩ر٢٪ ، ٢٨ر٩٪ للإناث والذكور على التوالى . وفي حالة الدجاج الخليط ٧٥٪ نجد أن مقياس النمو يقل عن الدجاج الخليط ٥٠٪ وعن الدجاج البلدى ولكنه يتساوى تقريبا مع الدجاج الأجنبى وقد لوحظ أيضا أن مقياس النمو للدجاج الأجنبى أقلها جميعا سواء للإناث أو الذكور.