

# RESTRICTED VERSUS FULL-FEEDING FOR GROWING CHICKENS

By

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A number of 360 day-old chicks of Fayoumi and Rhode Island Reds, in Dokky Poultry Farm, Min. of Agric., were sexed and fed: (a) full feed, (b) 85 percent of full feed and (c) 70 percent of full feed. The effect of feeding level on the average live-weight at 16-week old was highly significant ( $P = 0.01$ ), the effect of breed was significant ( $P = 0.05$ ) and no significance ( $P = 0.05$ ) was shown for sex. The interaction between breed and feeding level was significant ( $P = 0.05$ ) and that between sex and feeding level was highly significant ( $P = 0.01$ ) while no significance was shown between breed and sex.

It could be concluded that restricted reeding to about percent of full feed, in general, has markedly reduced the live-weight and the gain for both examined breeds when compared with the full feeding and the restriction of 85 percent.

Food restriction during the growing period of chickens could be achieved either by quantity or quality of food. The restriction of food quantity was made by two methods : (1) by giving certain amounts of food below the normal consumption (Fuller, 1962; Fuller and Dunahoo, 1962; Querner and Becker, 1962; Deaton and Quisenberry, 1963); (2) by limiting the time of feeding (Novikoff and Biely, 1945; Milby and Sherwood, 1953; and Ringrose, 1958). Luckham *et al.*, 1963, restricted feeding on whole-day basis as they removed the food for one or two days per week.

Several other investigators studied the restriction of food quality for chickens. Singen *et al.*, 1954, used high and low-efficiency rations. Sunde *et al.*, 1954, compared a complete diet with antibiotic or source of unidentified growth factor. and another diet without these supplements. Others compared between low and high-fibre diets with different calorie levels (Schneider *et al.*, 1955; Isaacks *et al.*, 1957 ; Pepper *et al.*, 1957 ; Pepper *et al.*, 1959 ; Cooper and Barnett, 1960 ; Isaacks *et al.*, 1960; Pepper *et al.*, 1961; Querner and Becker, 1962; Waldroup and Harnis, 1962; Deaton and Quisenberry, 1963 ; and Luckham *et al.*, 1963). Fuller, 1962, avoided mash feeding on range and fed the restricted birds only grains and minerals.

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By restricting the amount of food consumed during different time intervals of the growing period, a number of workers reported a reduction in body weight during this period. However, Ringrose, 1958, by limiting the time of feeding to four hours daily observed no difference in body weight between the restricted and the control birds at 20 weeks of age. Possibly, the restricted-fed birds got accustomed to take all their daily needs of food during the limited feeding time.

The same trend was obtained for the data reported by using the restriction of food quality. Chickens fed on deficient rations showed a reduction in their body weight than for controls, while other birds showed heavier body weight in the restricted levels than their controls (Qurner and Becker, 1962).

As a matter of fact, the largest gain per unit of food intake was made when the food consumption of a chicken was restricted to only 50 to 70 percent of the normal consumption (Titus, 1961) ; but the chickens, produced on the low food level, would have little fat and lower market value than those produced on full feed.

It is generally accepted that under ordinary conditions, male chickens are some-what more efficient in food utilization for growth than their females. This is probably due to the higher growth rate of the males on the same feeding level (Ackerson *et al.*, 1937 and Titus, 1961).

The aim of the present work is to study the efficiency of food utilization with male and female chicks of Fayoumi and Rhode Island Red breeds being fed : (a) full feed, (b) 85 percent of full feed and (c) 70 percent of full feed.

#### Materials and Methods

In Dokky experimental Poultry Farm, Giza, U.A.R., 180 Fayoumi and 180 Rhode Island Red (R.I.R.), day-old chicks were sexed. A sexing machine (Sortisex, German patent, chicks sex-tester) was used by investigating the sexual organs electrically with a genoscope. Six groups of 30 chicks for each sex and breed were initially allocated in an electric battery.

The full feed level was obtained from data of previous feeding experiment carried out in the same experimental farm, but for mixed sexes being fed ad lib. The amount of food offered was changed at bi-weekly interval. The food offered and its residue were recorded and food consumed was obtained by difference. Access fresh water was provided. The composition of the experimental diet is shown in table 1.

TABLE 1.—PERCENTAGE COMPOSITION OF EXPERIMENTAL DIET.

Ingredient	Per- cent	Ingredient	Per- cent
Ground maize . . . . .	37	Mineral Mixture (Commercial)	0.5
Rice bran . . . . .	25	Salt (table) . . . . .	0.5
Cotton seed meal (dec.) . .	13	<i>Proximate analysis (calculated):</i>	
Sesame meal . . . . .	5		
Maize gluten meal . . . . .	5	Crude Protein ( $N \times 6.25$ ) .	18.0
Wheat-bran . . . . .	5	Crude fibre . . . . .	5.6
Skim milk (dried) . . . . .	5	Metab. Energy*	
Lime stone (pulverized). . .	2	Kcal./g. diet . . . . .	2.7
Bone-meal . . . . .	2	T.D.N. %†. . . . .	65.8

\* Using the figures of Titus, 1961.

† Assuming 1g. TDN = 4.1 Kcal. metabolizable energy.

The experimental chicks, after being sexed and wing-banded at the first day of hatching, were individually weighed every week. Both sexes were checked superficially at 8-week old for Fayoumi and at 12-week old for R.I.R. chicks. The birds were then moved from the electric batteries (at 8-12 weeks old) to brooding pens provided with sun-porches surrounded and covered with 1 inch wire-mesh to keep the wild birds away from the experimental food-troughs. The food-troughs were placed on 0.5 inch wiremesh fixed by wooden frames, under which a piece of canvas was stretched to collect the scattered food, dust-free as much as possible.

### Results and Discussion

It has to be noted that the practical feeding levels were not exactly the same as the theoretical ones, due to scattered food and mortality of some experimental birds.

Fig. 1, Shows the weekly average live-weight plotted against age in weeks up to 16-week old for male and female Fayoumi and R.I.R. chicks for different feeding levels.

Table 2, shows the summarized data of male and female Fayoumi chicks, for 8 and 16 weeks old. For the sake of clarity the data are presented and discussed as follows :

#### 1. Fayoumi Breed

##### 1.1. Males :

1.1.1. 8-week old. The values, in table 2, for the average live-weight and live-weight gain decreased with the decrease of food intake. The average live-weight was 339.1, 316.7 & 263.0 g. for treatments, 'A', 'B' and 'C' respectively for the corresponding practical feeding levels of 100, 75.9 and 64.2 percent of the full feed. Selim, 1964, with male Fayoumi chicks at the same age, being fed *ad lib.* obtained an average live-weight of 306.2 g. It has to be noted that Abderrahim, 1966, under similar restricting condition of 100, 84.0 and 78.9 percent of full feed with mixed sex at the same age, obtained values for the live-weight of 335.8, 298.7 and 280.8 g. respectively.

The average daily food intake from 0 to 8 weeks old per chick (table 2) was 18.7, 14.2 and 12.0 g. for treatments 'A', 'B' and 'C' respectively. Selim, 1964, with full-feed level, recorded a value of 22.0 g. for mixed sex of Fayoumi chicks. However, Abderrahim, 1966, with Fayoumi chicks, a calculated value of 47. g. for the average daily food intake of full feed level up to 8-week old, could be considered too high. The author, anyhow, did not mention any precautions or details for scattered food record.

The feed efficiency values for treatments 'B' and 'C' were superior to treatment, 'A' being 2.90, 2.93 and 3.60 respectively. The value of 4.4 for feed efficiency was obtained by Selim, 1964, with Fayoumi chicks being fed *ad libitum*. However, a calculated value of 7.6 for feed efficiency was obtained from data recorded by Abderrahim, 1966. Obviously, this high value is due to excess food consumption where scattered food was not considered.

It appears, with male chicks that 85 percent of full feed level (practically 75.9%) gave the best feed efficiency which was nearly the same as with 70 percent of full feed (practically 64.2%). The former feed level, in addition, showed higher final live-weight than the latter at 8-week old, being 53.7g. or 20.4 percent higher.

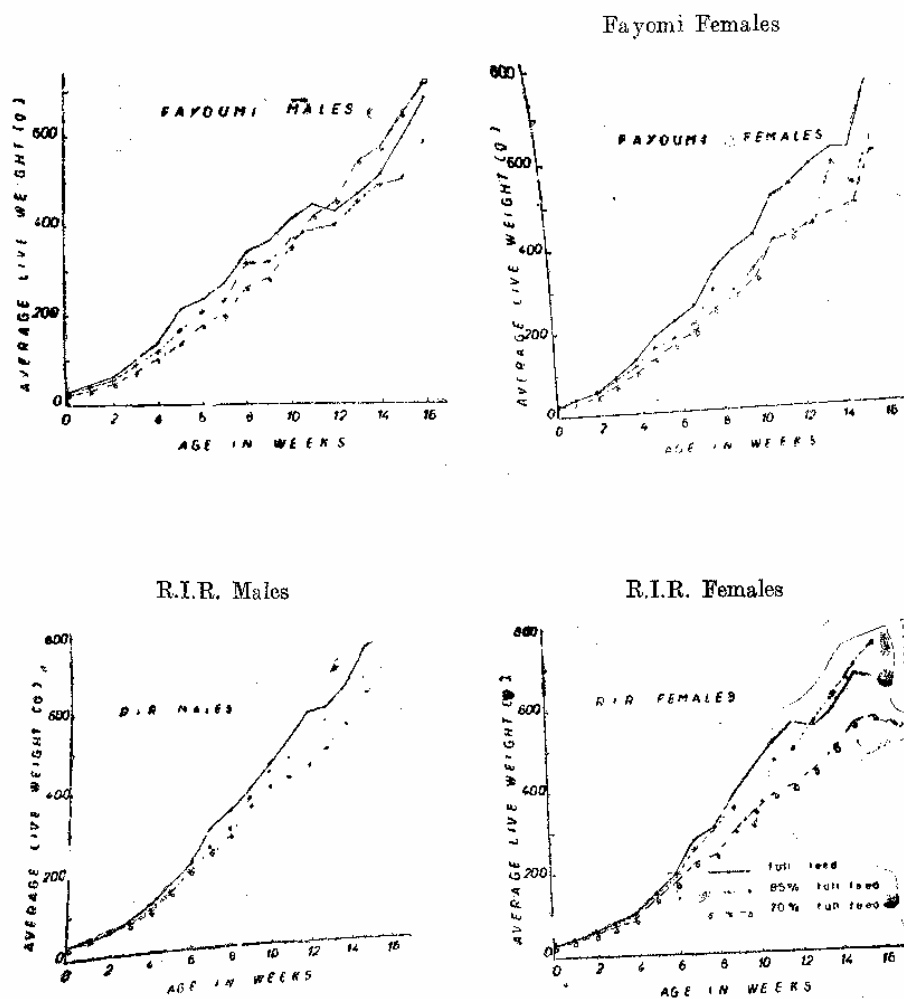


FIGURE 1.—The Weekly Average Live-Weight Plotted Against Age in Weeks up to 16-Week old for Experimental Chicks.

TABLE 2.—THE EFFECT OF DIFFERENT FEEDING LEVELS ON GROWING  
FAYOUMI CHICKENS (INITIAL WEIGHT BEING 29.7 g. FOR MALES  
AND 29.3 g. FOR FEMALES).

Treatment	Number of chicks	Age in weeks	Avg. live-weight <sup>(1)</sup> ± S.E. g.	Avg. daily live-weight gain g.	Avg. daily food intake <sup>(2)</sup>		Food per unit gain
					g.	% cont.	
<i>Males :</i>							
'A' Full feed	20	8	339.1± 9.9 (13)	5.2	18.7	100	3.60
	13	16	686.8±21.2 (11.1)	5.7	35.0	100	6.14
'B' 85 % full feed	27	8	316.7±13.5 (22)	4.9	14.2	75.9	2.90
	16	16	587.5±28.5 (19)	4.9	26.0	74.3	5.31
'C' 70 % full feed	28	8	263.0±14.5 (29)	4.1	12.0	64.2	2.93
	11	16	718.5±54.3 (24)	6.0	23.8	68.0	3.97
<i>Females :</i>							
'A' Full feed	40	8	344.2±10.3 (19)	5.3	16.5	100	3.11
	20	16	684.0±26.9 (18)	5.8	32.8	100	5.66
'B' 85 % full feed	32	8	296.8±20.7 (30)	4.5	15.4	93.3	3.42
	15	16	651.0±19.5 (12)	5.4	29.6	90.2	5.48
'C' 70 % full feed	31	8	251.0± 9.9 (22)	3.7	12.0	72.7	3.24
	17	16	568.0±10.3 (8)	4.7	21.6	65.8	4.60

(1) Figures in parantheses are coefficients of variation (C%).

(2) Avg. daily food intake is expressing the average from day-old up to the stated age.

1.1.216-week old. Table 2 shows the marked difference in the average live-weight giving values of 686.8, 587.0 and 718.5g. for treatments 'A', 'B' and 'C' respectively. Apparently, the latter value is the highest one recording a high standard error of 54.3g. and the highest variability (24%). It means that the live-weight, for the birds in this treatment at 16-week old, was extremely variable, indicating perhaps some unknown factors. However, Selim, 1964, with full-fed Fayoumi chicks obtained a value of 731.7g. at 16-week old. Abderrahim, 1966, with Fayoumi chicks at similar age being fed 100, 94.7 and 94.2 percent of full feed recorded values for live-weight of 778.2, 736.7 and 733.4g. respectively.

The respective average daily food intake per chick was 35.0, 26.0 and 23.8 g. for treatments 'A', 'B', 'C' corresponding to a practical food intake of 100, 74.3 and 68.0 percent of full feed. Selim, 1964, recorded an average value of 42 g. for daily food intake with full-fed Fayoumi chicks. However, a calculated value of 61 g. was obtained from the data of Abderrahim, 1966.

## 1.2. Females :

1.2.1. 8-week old. It can, also, be seen from table 2 that the average live-weight values for 8-week old female chicks were 344.2, 296.8 and 251.3 g. for treatments 'A', 'B' and 'C' respectively showing a decrease with the restriction of food intake. These values may be compared with those obtained by Selim, 1964, ranging from 283.2 to 314.1g. for female birds, fed *ad libitum*.

The average daily live-weight gain values were 5.3, 4.5 and 3.7g. for treatments 'A', 'B' and 'C' respectively. The value for treatment 'B' is comparable with 4.6g. for female chicks obtained by Selim, 1964, with full feed level.

The average daily food intake per bird was 16.5, 15.4, and 12.0g. corresponding to 100, 93.3 and 72.7 percent of full feed for treatments 'A', 'B' and 'C' respectively. The value for full feed of 16.5g. was markedly less than that of 23.3g. recorded by Selim, 1964, with Fayoumi chicks for mixed sex.

The feed efficiency values were 3.11, 3.24 and 3.24 for treatments 'A', 'B' and 'C' respectively being the best with the full feed level.

1.2.2 16-week old. The average live-weight, as shown in table 2, was 684.4, 651.0 and 568.0 g. for treatments 'A', 'B' and 'C' respectively. These values may be compared with those obtained by Selim, 1964, ranging between 621.0 and 687.3g. for the similar breed, age and sex when feeding the birds *ad libitum*.

The average daily live-weight gain was 6.6, 5.4 and 4.7 g. for treatments 'A', 'B' and 'C' respectively being the highest with full feed.

The average daily food intake per bird was 32.8, 29.6 and 21.6 g. being 100, 90.2 and 65.8 percent of full feed for treatments 'A', 'B' and 'C' respectively.

The feed efficiency values were 5.66, 5.48 and 4.60 for treatments 'A', 'B' and 'C' respectively being the best with the lowest food intake. These values are comparable with those recorded by Selim, 1964, ranging from 4.8 to 5.4.

## 2. Rhode Island Red (R.I.R.).

### 2.1 Males.

2.1.1 *8-week old.* The average daily live-weight (table 3) was 337.5, 294.7 and 272.6 g. for treatments 'A', 'B' and 'C' respectively, decreasing with the decrease in food intake. The corresponding average daily live-weight gain was 5.3, 4.5 and 4.1 g.

The average daily food intake was 20.0, 18.1 and 17.2 g. corresponding to 100, 90.5 and 86.0 percent of full feed for treatments 'A', 'B' and 'C' respectively.

The feed efficiency values were 3.77, 4.02 and 4.20 for treatments 'A', 'B' and 'C' respectively being the best for full feed level.

2.1.2. *16-week old.* It can be seen from table 3 that the average live-weight was 776.2, 687.2 and 650.5 g. for treatments 'A', 'B' and 'C' respectively, decreasing with the restriction of food intake. However, the average live-weight for mixed sex of the same breed ranged between 738 and 1371 g. as recorded by Aboul-Seoud and Shulkamy, 1963, and from 1175 to 1235 g. by Aboul-Seoud and Ismail, 1963.

The average daily live-weight gain was 6.6, 5.8 and 5.4 g. for treatments 'A', 'B' and 'C' corresponding to 100, 84.0 and 71.5 percent of full feed respectively.

The feed efficiency values were ranging from 5.02 (treatment 'C') to 5.32 (treatment 'A'), being the best with the lowest feeding level. It is noted that a decrease of 28.5 percent of the full feed level gave a decrease of 16.2 percent in the live-weight and 18.1 percent in the live-weight gain.

### 2.2 Females :

2.2.1 *8-week old.* The average live-weight was 311.6, 340.7 and 246.3 g. for treatments 'A', 'B' and 'C' respectively. However, Aboul-Seoud and Shulkamy, 1963, recorded values for mixed sex of R.I.R., with different feeding treatments, ranging from 178 to 602 g., while Aboul-Seoud and Ismail, 1963, obtained values between 405 and 480 g.

The average daily live-weight gain was 4.8, 5.3 and 3.7 g. for treatments 'A', 'B' and 'C' respectively, being the best for the 85 percent of the full feed level.



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The average daily food intake was 21.0, 18.1 and 16.3 g. for treatments 'A', 'B' and 'C' corresponding to 100, 86.2 and 77.6 percent of the full feed level respectively. The respective feed efficiency values were 4.38, 3.42 and 4.41 being the best for treatment 'B'.

TABLE 3.—THE EFFECT OF DIFFERENT FEEDING LEVELS ON GROWING R.I.R CHICKENS (INITIAL WEIGHT BEING 34.4 G. FOR MALES AND 34.3 G. FOR FEMALES).

Treatment	Number of chicks	Age in weeks	Avg live-weight <sup>(1)</sup> ± S.E. g.	Avg. daily live-weight gain g.	Avg. daily food intake <sup>(2)</sup>		Food per unit gain
					g.	% cont.	
<i>Males :</i>							
'A'. full feed	26	8	337.5±17.1 (26)	5.3	20.0	100	3.77
	17	16	776.2±37.4 (20)	6.6	35.1	100	5.32
'B'. 85% full feed	24	8	294.7±15.0 (25)	4.5	18.1	90.5	4.02
	17	16	687.2±27.4 (16)	5.8	29.5	84.0	5.09
'C'. 70% full feed	20	8	272.6±15.6 (26)	4.1	17.2	86.0	4.20
	17	16	650.5±32.0 (20)	5.4	27.1	71.5	5.02
<i>Females :</i>							
'A'. Full feed	25	8	311.6±15.5 (26)	4.8	21.0	100	4.38
	14	16	668.2±34.2 (19)	5.6	42.2	190	7.54
'B'. 85% full feed	18	8	340.7±14.0 (18)	5.3	18.1	86.2	3.42
	16	16	750.8±33.1 (18)	6.3	31.7	75.1	5.03
'C'. 70% full feed	22	8	246.3±11.5 (22)	3.7	16.5	77.6	4.41
	16	16	571.1±26.2 (18)	4.7	25.6	60.9	5.45

(1) Figures in parantheses are coefficients of variation (C%).

(2) Avg. daily food intake is expressing the average from day-old up to the stated age.

2.2.2 16-week old. The average live-weight was 668.2, 750.8 and 571.1 g. for treatments 'A', 'B' and 'C' respectively, the corresponding daily gain being 5.6, 6.3 and 4.7 g.

The average daily food intake was 42.2, 31.7 and 25.6 g. for treatments 'A', 'B' and 'C' corresponding to 100, 75.1 and 60.9 percent of the full feed respectively.

The corresponding feed efficiency values were 7.54, 5.03 and 5.45, giving the best result for treatment B which recorded higher live-weight and gain than for other feeding levels.

#### Statistical data :

Statistical analysis was carried out using the analysis of variance (Snedecor, 1957). The average live-weight for birds at 16-week old showed that : (1) the variation due to treatment (feeding level) was highly significant ( $P = 0.01$ ), while that due to breed was significant ( $P = 0.05$ ) and no significant difference was shown for sex ( $P = 0.05$ ) ; (2) the interaction between breed and treatment was significant ( $P = 0.05$ ), while that between sex and treatment was highly significant ( $P = 0.01$ ), and it was not significant between breed and sex ( $P = 0.05$ ).

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### مقارنة بين التغذية للشبع والتغذية المحدودة على الكفايت النامية

فهمى الحسينى عبد السلام - أحمد عبد الله أبو السعود - أحمد كمال أبو رية

#### الملخص

أجريت التجربة بمزرعة الدواجن بالدقى بوزارة الزراعة حيث تم تجنيس ٣٦. ككوت فيومى ورود ايلاند احمر حديثة الفقس وبعد فصل الذكور والاناث غذيت كما يلى :

- (أ) تغذية للشبع .
- (ب) ٨٥٪ من الشبع .
- (ج) ٧٠٪ من الشبع .

فكان تأثير مستوى التغذية على متوسط الوزن الحى عند عمر ١٦ أسبوع معنوياً بدرجة كبيرة احصائياً ( على مستوى ٠.١ ر. ) وتأثير السلالة كان معنوياً ( على مستوى ٠.٥ ر. ) ولم يوجد فرق يذكر احصائياً ( على مستوى ٠.٥ ر. ) بالنسبة للجنس . وكان التأثير المتبادل بين السلالة والمستوى الغذائى ذو فرق معنوى ( على مستوى ٠.٥ ر. ) وبين الجنس والمستوى الغذائى كان التأثير معنوياً بدرجة كبيرة ( على مستوى ٠.١ ر. ) بينما لم يوجد تأثيرا متبادلا يذكر احصائياً بين السلالة والجنس .

وتدل نتائج هذه الدراسة على أن تحديد الغذاء الى ٧٠٪ من الشبع قد خفض بصفة عامة الوزن الحى بشكل واضح للسلالتين المختبرتين عن مثيلتهما فى حالتى التغذية للشبع أو ٨٥٪ من الشبع .

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- (١) ، (٢) قسم بحوث تغذية الدواجن - الادارة العامة للانتاج الحيوانى بوزارة الزراعة الدقى - ج ٠ ع ٠ م ٠
  - (٣) فرع تغذية الحيوان - قسم الانتاج الحيوانى - كلية الزراعة - جامعة القاهرة - ج ٠ ع ٠ م ٠