Egypt. J. Anim. Prod. 24, No., 1-2 pp. 31-40 (1984)

The Effect of Restricted Feeding During the Growing Period on Subsequent Performance of Fayoumi and Ross Tint laying Hens

H.M. Negm, G.A.R. Kamar, S.A. Riad and A. Mangood

Anim. Prod. Dept., Fac. Agric., Cairo University and Tanta University.

A TOTAL of 1600 day old chicks from both Fayoumi and Ross Tint birds were used. All chicks were kept on floor and raised under the same invironmental condition. At six weeks of age, only females from the two breeds reared on three different feeding systems : Fullfed, Skip-a-day and 50 % diet. All hens at 21 weeks of age were switched to layer diet which were provided *ad lib.*

Restricting feed intake retarded growth from 6-20 wks. of age in both breeds. The two feed restricting programs delayed sexual maturity significantly for both breeds. 50 % diet method and Skip-a-day program saved about 44 % and 20 % feed, respectivly in comparison with the consumption of Full-fed treatment. The restricting program did not affect significantly egg number, egg size and egg mass of the two breeds. There was a decided advantage returns for the Full-fed birds than the two restricted programs.

Ross Tint birds produced favour body weight, sexual maturity, egg number, egg weight, egg mass, feed conversion and net income than the Fayoumi birds.

In the course of the last 50 years, many practical poultry-men believed from their observations that pullets may develop larger body size and this would subsequently result in larger initial and maintained egg weight if sexual maturity was delayed. Lillie and Denton (1966) found that restricting feed intake during the growing period caused a delay in sexual maturity. The delay in sexual maturity was evaluated by about two weeks (Gowe *et al.*, 1960) and by 2-4 weeks (Schneider *et al.*, 1955) with restricted feeding program during the growing period.

Strain *et al.* (1965) ; Leeson and Summers (1979) reported that body weight was reduced by feed restriction. The body weight reduction at 21 weeks of age was evaluated by 0·83 - 0·77 lb/bird (Isaacks *et al.* 1960) and by 288 gms. (Gowe *et al.* 1960). Hollands and Gowe (1961) found also that feed restriction had retarded the development of body weight by 25%.

Wright *et al.* (1968) ; Abbott and Gouch (1971); Hakim and Attia (1972) Showed that restricted fed birds laid more egg number and larger egg size. However, Carlson and Nelson (1980) did not found any effect due to restrict feeding program on egg production and egg weight.

The purpose of the present work is to study the effect of restricted feeding during the growing period upon subsequent performance traits with special attention to the return of two laying breeds Fayoumi as a local breed and Ross Tint as a commercial egg-type stock.

Material and Methods

This study was conducted to investigate the effect of the feed restricting program during the period from 6-20 weeks of age on two periods. One for evaluating the growing period (6-20 weeks) and the other for the laying period (21-72 weeks). The experiment lasted from March 28, 1979 until August 13, 1980 for 72 weeks life span.

A total of 1600 day-old chicks from both Fayoumi and Ross Tint birds were used. From one day-old to 6 weeks of age, all chicks were kept on floor and raised under the same environmental condition. They were fed *ad libitum* on a diet containing 16·92% crude protein and 2613 Kcal M.E./ kg diet. At six weeks of age, sexing was carried out and only femals were used in the study.

The first part of the study started on May 9, 1979 until August 15, 1979 (6-20 wks.). All females from each of the two breeds, Fayoumi and Ross Tint reared on three different feeding systems : 1-Full-fed=*ad libitum*, 2-Skip-a-day =feeding was offered every other day, 3-50% diet = 50% of daily feed from the recommended requirement. All the birds were exposed to the natural day light and provided growing diet containing 16·24% crude protein and 2629 Kcal M.E./ kg diet. Water was provided *ad lib.* Body weight and feed consumption were recorded every two weeks from 6 to 20 weeks of age. Number of days to first egg was recorded for each dietary treatment for both breeds.

The second period started on August 15, 1979 until August 13, 1980 (21-72 wks.). All treatments were switched to layer diet which containing 14·96 % crude protein and 2648 Kcal M.E./kg diet. Food and water were provided *ad lib.* The day light has been increased artificially to be 17 hr daily. Trapnests were placed in all pens. Records for egg number, egg weight and feed consumption were registered from 21 to 72 weeks of age. Feed conversion were calculated to determine the amount of feed (kg) which is required to produce one kg. of eggs.

Statistical analysis were carried out according to (Snedecor and Cochran, 1967). Duncan s multiple range test was used to test the significance of mean differences.

At the end of the experiment, the economic returns were evaluated for the different treatments. The cost of the day old chick (nonsexed) was 0·12 and 0·16 LE (Egyptian pounds) for Fayoumi and Ross Tint, respectively. The cost for food was 99·880 LE, 87·885 LE, and 83·105 LE/ton for starter (0-6 wks.), grower (7-20 wks.) and layer (21-72 wks.), respectively. The price

was 0·85 LE and 1·100 LE for one Kilo eggs and one Kilo live weight, respectively. The total costs and incomes in each treatment were divided by the number of birds housed at 21 weeks of age. Egg income included all eggs collected through the laying period (52 wks.). At the end of 72 weeks birds were selling as live weight.

Results and Discussion

Growing period

1· *Body weight*

It is clear that restricting feed intake retarded growth in both breeds, as shown in Table 1. Full-fed Ross Tint and Fayoumi had significantly ($P \leq 0.01$) heavier body weight at 20 weeks of age followed by birds given the Skip-a-day feeding program then those fed 50 % diet. These results are in agreement with the data obtained by Lillie and Denton (1966) and Hakim and Attia (1972).

TABLE 1. Mean values of body weight(gm) and sexual maturity (days) of Fayoumi and Ross Tint pullets raised under different restricted feeding systems from 6—20 weeks of age.

Age in wks	Ross Tint			Fayoumi		
	Fullfed	Skip-a-day	50% diet	Fullfed	Skip-a-day	50% diet
			Body Weight (g)			
6	279.8^{a}	279.8^{a}	279.7^{a}	191.5^{b}	191.4^{b}	192.4^{b}
8	477.5^{a}	421.7^{b}	457.0^{c}	288.2^{d}	265.6^{e}	289.5^{d}
10	610.5^{a}	510.4^{b}	513.0^{b}	389.6^{c}	342.0^{d}	366.0^{cd}
12	740.7^{a}	611.8^{b}	631.2^{b}	570.7^{c}	478.8^{d}	488.6^{d}
14	893.8^{a}	826.7^{b}	717.7^{cd}	755.9^{c}	641.0^{e}	702.0^{d}
16	1031.8^{a}	866.3^{b}	794.0^{c}	905.7^{b}	802.7^{c}	730.0^{d}
18	1117.4^{a}	972.5^{b}	865.0^{c}	985.8^{b}	882.6^{c}	770.0^{d}
20	1276.0^{a}	1089.6^{b}	966.3^{c}	1044.5^{b}	954.4^{c}	831.4^{d}
			Sexual Maturity (days)			
Days	180^{a}	186^{b}	188^{b}	188^{b}	193^{c}	195^{c}

a b c d e values followed by different letter in the same row are significantly different ($P \leq 0.01$).

Analysis of variance revealed significant differences in body weight between breeds and treatments through the entire growing periods. The difference between the breeds may be related to their genetic basis.

2. *Sexual maturity*

Sexual maturity is shown in Table 1. In general, Fayoumi pullets took from 7-8 days longer to lay first egg. The two feed restricting programs delayed sexual maturity significantly ($P \leq 0.01$) for both breeds. These results were in agreement with Lillie and Denton (1966) and Hakim and Attia (1972). Gowe *et al* (1960) found a delay of sexual maturity by 12 days due to restricting feed intake to 70 %. The differences in sexual maturity between the two breeds and the three treatments were highly significant.

3. *Feed consumption*

Although Fayoumi pullets were lighter in body weight than Ross Tint pullets, in general the formar consumed similar feed from 6-20 weeks of age (Table 2). Within each breed, the feed consumption was the largest amount in the Full-fed treatment followed by Skip-a-day program then 50 % diet method. It was meant that 50 % diet method and Skip-a-day program saved about 44 % and 20 % feed respectively in comparison with the consumption of Full-feed treatment.

TABLE 2. Feed consumption/pullet (gm) of Fayoumi and Ross Tint pullets raised under different restricted feeding systems from 6—20 weeks of age.

Age in wks.	Ross Tint			Fayoumi		
	Fullfed	Skip-a-day	50% diet	Fullfed	Skip-a.day	50% diet
6—8	536	462	406	658	448	350
8—10	714	540	511	770	574	420
10—12	938	658	546	952	658	420
12—14	980	756	567	980	826	490
14—16	938	784	585	1050	910	490
16—18	1036	882	588	1078	924	560
18—20	1162	952	693	1176	952	560
6—20	6304	5034	3896	6664	4292	3290

Laying period

1 *Egg number.*

The data in Table 3 show the egg number produced for the two breeds during 52 weeks. The average egg number by Ross Tint (221.6) was significantly ($p \leq 0.01$) higher than Fayoumi production (190.2). Although there was no significant difference in egg number between treatments, it was evident in Fayoumi birds a trend of slightly greater egg number for the restricted groups compared with the Fullfed group, but not in Ross Tint. These results are in agreement with that reported by Schneider *et al.* (1955) and Gowe *et al.* (1960). They found little difference in egg production between restricted and control groups.

TABLE 3. Mean values of egg number/hen for Fayoumi and Ross Tint pullets raised undre differerent feeding systems from 6-20 weeks of age.

Age in wks.	Ross Tint			Fayoumi		
	Fulled	Skipa-day	50% diet	Fulled	Skipa-day	50%diet
21—24	0.46	0.59	0.20	0.22	0.04	
25—28	11.9^{a}	10.2^{b}	9.8^{b}	5.7^{c}	6.2^{c}	4.2^{d}
29—32	23.4^{a}	21.4^{b}	21.3^{b}	20.6^{c}	19.0^{cd}	17.8^{d}
33—36	22.3^{a}	20.6^{a}	21.2^{a}	18.8^{b}	19.5^{b}	18.5^{b}
37—40	21.1^{a}	21.6^{a}	20.4^{a}	19.1^{b}	20.2^{ab}	19.8^{b}
41—44	18.9^{a}	19.9^{a}	19.0^{a}	19.8^{a}	18.8^{a}	19.7^{a}
45—48	19.9^{a}	19.8^{a}	19.4^{a}	19.8^{a}	19.1^{a}	18.6^{a}
49—52	19.5^{a}	21.0^{b}	21.0^{b}	19.3^{a}	17.1^{c}	17.7^{c}
53—56	20.6^{a}	21.0^{a}	20.5^{a}	17.8^{b}	15.9^{c}	17.5^{b}
57—60	19.3^{a}	18.9^{a}	20.1^{a}	15.8^{b}	14.2^{c}	16.6^{b}
61—64	18.6^{a}	17.2^{a}	18.2^{a}	10.3^{b}	12.8^{c}	14.1^{c}
65—68	16.7^{a}	15.4^{a}	16.7^{a}	10.0^{b}	13.5^{c}	13.2^{c}
69—72	12.7^{a}	11.1^{a}	13.1^{a}	13.3^{a}	12.4^{a}	13.7^{a}
Total	225.36^{a}	218.69^{a}	220.90^{a}	190.52^{b}	188.74^{b}	191.40^{b}

a,b,c,d, values followed by different letter in the same row are significantly different ($P \leq 0.05$).

Wright *et al.*(1968) ; Abbott and Couch (1971) and Hakim and Attia (1972) found that the rate of egg production for the restricted feed birds was significantly higher than the Full-fed birds.

2. *Egg weight*

Average egg weight values are shown in Table 4. There were a highly significant difference between breeds. Eggs laid by Ross Tint (54·8 g) were always significantly ($P \leq 0.01$) heavier than by Fayonmi (43·7 g).

There are insignificant differences between treatments. This result is in agreement with that reported by Gowe *et al.* (1960) who did not find any difference in egg weight produced by pullets reared on restricted feeding program.

TABLE 4. Mean values of egg weights(g) of Fayoumi and Ross Tint pullets raised under different restricted feeding systems from 6—20 weeks of age.

Age in wks.	Ross Tint			Fayoumi		
	Fullfe	Skip-a-day	50% diet	Fullfed	Skip a-day	50% diet
21—24	45	47	44	34	30	—
25—28	51^{a}	50^{a}	50^{a}	38^{b}	38^{b}	38^{b}
29—32	53^{a}	52^{b}	52^{a}	41^{c}	41^{c}	40^{b}
33—36	55^{a}	54^{b}	53^{c}	42^{e}	43^{d}	42^{e}
37—40	57^{a}	55^{b}	55^{b}	44^{c}	44^{c}	43^{e}
41—44	57^{a}	56^{b}	55^{c}	45^{d}	45^{d}	45^{d}
45—48	58^{a}	56^{b}	56^{b}	46^{c}	47^{d}	46^{c}
49—52	58^{a}	58^{a}	57^{b}	46^{c}	47^{d}	46^{c}
53—56	58^{a}	58^{a}	58^{a}	47^{b}	47^{b}	46^{c}
57—60	59^{a}	58^{a}	58^{a}	46^{b}	46^{b}	45^{b}
61—64	59^{a}	59^{a}	58^{a}	45^{b}	45^{b}	44^{b}
65—68	56^{a}	57^{a}	56^{a}	46^{b}	45^{b}	45^{b}
69—72	54^{a}	53^{a}	54^{a}	48^{b}	48^{b}	48^{b}
21—72	55^{a}	54^{a}	54^{a}	43^{b}	43^{b}	44^{b}

abcde values followed by different letter in the same row are significantly different ($P \leq 0.50$)

3· *Egg mass*

Since there are differences between breeds in egg size and egg number, egg mass may give more interpretation for the production potential of the two breeds. The data in Table 5 show that the mean production of egg mass for Ross Tint birds (12165 g) was significantly higher than that of Fayoumi birds (8329 g), during the 52 weeks of egg production. That means that Ross Tint birds produced 46% more egg mass than the quantity produced by Fayoumi birds.

4· *Feed conversion*

The data in Table 6 show the mean values of feed conversion (kg feed/kg egg) from 21-72 weeks of age for Ross Tint and Fayoumi pullets. It shows that the Full-fed pullets make a little better use of feed during the laying period for both breeds. Lillie and Denton (1966) did not observe also any better feed efficiency for the restricted pullets.

TABLE 5. Mean values of the egg mass from 21-72 weeks of age for Ross Tint and Fayoumi pullets.

Age in wks.	Ross Tint			Fayoumi		
	Fullfed	Skip-a-day	50% diet	Fullfed	Skip-a-day	50% diet
21—24	20.3	27.2	9.0	7.0	1.2	—
25—28	608^{a}	518^{b}	488^{b}	219^{c}	237^{c}	159^{d}
29—32	1242^{a}	1122^{b}	1099^{b}	845^{c}	771^{cd}	721^{d}
33—36	1228^{a}	1106^{b}	1131^{a}	793^{c}	831^{c}	770^{c}
37—40	1192^{a}	1194^{a}	1113^{a}	854^{b}	897^{b}	861^{b}
41—44	1082^{a}	1108^{a}	1049^{a}	895^{b}	853^{b}	882^{b}
45—48	1152^{a}	1114^{a}	1089^{a}	907^{b}	888^{b}	855^{b}
49—52	1132^{a}	1218^{b}	1205^{ab}	889^{c}	797^{c}	805^{c}
53—56	1201^{ab}	1212^{a}	1198^{a}	824^{b}	752^{c}	810^{b}
57—60	1125^{ab}	1091^{b}	1164^{a}	724^{cd}	658^{d}	755^{c}
61—64	1095^{a}	1000^{b}	1057^{ab}	461^{c}	573^{d}	621^{d}
65—68	936^{a}	868^{a}	934^{a}	449^{b}	611^{c}	593^{c}
69—72	690^{a}	596^{b}	709^{a}	630^{ab}	601^{b}	653^{ab}
21—72	12595^{a}	11962^{a}	11939^{a}	8389^{b}	8321^{b}	8278^{b}

abcd values followed by different letter in the same line are significantly different ($P \leq 0.05$)

Economic aspects

In order to obtain a single measure of effectiveness of the three feeding programs for the two breeds, the costs and returns were evaluated and presented in Table 7. There was a decided advantage returns for the Full-fed birds than the other two programs. Slight increase in return was in favor for Skip-a-day program group over the 50 % diet group. Ross Tint birds gave 64 % more returns than Fayoumi pullets. These results are in agreement with that reported by Proudfoot and Gowe (1967) who found that feed restriction during the rearing period failed to improve economic traits compared with Full-feeding.

TABLE 6: Mean values of feed conversion (kg feed/ kg egg) from 21—72 weeks of age for Fayoumi and Ross Tint pullets raised under different restricted feeding systems from 6—20 weeks of age.

Age in wks	Ross Tint			Fayoumi		
	Fullfed	Skip-a-day	50% diet	Fullfed	Skip-a-day	50% diet
21—24	10.86	11.43	8.98	13.00	11.14	8.57
25—28	9.89	5.10	5.41	6.55	7.32	7.60
29—32	2.85	3.02	3.01	3.69	4.03	4.51
33—36	3.22	3.49	3.44	4.30	4.14	4.19
37—40	3.00	3.08	3.28	3.63	3.27	3.98
41—44	3.42	3.29	3.34	3.46	3.89	3.50
45—48	3.19	3.20	3.32	3.26	3.38	3.15
49—52	3.26	2.94	2.84	2.89	3.09	3.92
53—56	2.96	2.75	2.75	3.75	4.35	4.92
57—60	3.08	3.26	2.88	3.67	4.14	3.40
61—64	3.16	3.44	3.10	5.21	4.41	4.11
65—68	3.43	3.59	3.43	5.88	4.53	4.90
69—72	4.61	5.24	4.46	4.50	4.29	4.31
21—72	3.54	3.65	3.57	4.45	4.63	4.61

TABLE 7. Feed costs, income and profits for Full-fed, Skip-a-day and 50% diet as grower restriction program based on local prices for eggs and meat, and local prices for baby chicks and feed in LE for Ross Tint and Fayoumi.

Type of grower feeding program	Price baby chicks	Feed cost/bird				Income			Net income pit per bird	+or— Profit
		Starter	Grower	Layer	Total	Eggs	Meat	Total		
Ross Tint										
full-fed	0.160	0.123	0.554	3.721	4.558	9.886	1.603	11.489	6.931	—
Skip-a-day	0.160	0.123	0.442	3.661	4.258	0.090	1.351	10.441	6.055	−0.876
50% diet	0.160	0.123	0.342	3.560	4.185	8.781	1.325	10.106	5.921	−1.010
Fayoumi										
Full-fed	0.120	0.083	0.586	3.207	3.996	6.760	1.457	8.217	4.221	—
Skip-a-day	0.120	0.083	0.465	3.304	3.972	6.452	1.477	7.929	3.957	+ 0.264
50% diet	0.120	0.083	0.289	3.260	3.752	6.220	1.321	7.541	3.789	−0.432

References

Abbott, W.W. and Couch, J.R. (1971) An evaluation of the various methods of delaying sexual maturity and their effects upon subsequent reproductive performance of broiler replacement pullets. *Poultry Sci.*, **50**, 1542.

Carlson, C.W. and Nelson, R.A. (1980) Grower diets and their effects upon subsequent performance of layer type pullets. *Poultry Sci.*, **60**, 1272.

Gowe, R.S., Johnson, A.S., Grawford, R.D., Downs, J.H., Hill.A.T., Mountain, W.F., Pelletier, J.R. and Strain (1960) Restricted versus full-feeding during the growing period for egg production stock. *Nutrition Abstracts and Review*, **31**, 342.

Hakim, N.F.A. and Attia, F.M. (1972) Effect of feed restriction on the laying house performance of the Fayoumi chicks. *Egypt. J. Anim. Prod.* **12**, No. 1, 29.

Hollands, K.G. and Gowe, R.S.(1961) The effect of restricted and full feeding during confinement rearing on first and second year laying house performance. *Poultry Sci.*, **40**, 574.

Isaacks, R.E., Reid, B.L., Davies, R.E., Quisenberry, J.H. and Couch, J.R. (1960) Restricted feeding of broiler type replacement stock. *Nutrition Abstract and Review*,**31**, 342

Leeson, S. and Summers, J.D. (1979) Step-up protein diets for growing pullets. *Poultry Sci.* **58**, 681.

Lillie, J. Robert and Denton, C.A.(1966) Effect of nutrient restriction on White Leghorns in the grower and subsequent layer periods, *Poultry Sci.*, **45**, 810.

Proudfoot, T.G. and Gowe, R.S. (1967) The Effect of photoperiodism and rearing period feed restriction on the performance of five Leghorn strains. *Poultry Sci.*, **46**, 1056.

Schneider, A.J., Bohren B.B. and Anderson, V.L. (1955) The effect of restricted feeding on several genetically controlled characters in the fowl. *Poultry Sci.* **34**, 691.

Snedecor, G.W. and Cochran, W.G. (1967) *Statistical Methods*, 6th Iowa State University Press, Ames, Iowa U.S.A.

Strain, J.H., Gowe, R.S. Crawford, R.D. Hill, A.T., Slen, S.B. and Mountain, W.F. (1965) Restricted feeding of growing pullet s. I. The effect on the performance traits of egg production stock. *Poultry Sci.*, **44**, 701.

Wright, C.F., Damron, B.L., Waldroup, P.W. and Harms, R.H.(1968) The performance of laying hens fed normal and low protien diets between 8and 18 weeks of age. *Poultry Sci.*, 47, 635.

تاثير تحديد الغذاء خلال فترة النمو على الصفات الانتاجية للفيومى والروس

حامد نجم ، محمد جمال الدين قمر ، سوزان احمد رياض وانور عبد العزيز منجوه

كليتى الزراعة ، جامعتى القاهرة وطنطا ، مصر

شملت هذه الدراسة ١٦٠٠ كتكوت فيومى وروس تمت حضانتهم من عمر يوم حتى عمر ٦ أسابيع تحت نفس الظروف العادية • عند عمر ٦ أسابيع أخذت الاناث فقط لاجراء هذه التجربة حيث قسمت لثلاث مجاميع محدد بها نظام التغذية من عمر ٦ ــ ٢٠ أسبوع تبعا لما يلى :

المجموعة الأولى : التغذية على علف عادى طول الوقت •

المجموعة الثانية : صيام يوم واعطاء علف عادى يوم •

المجموعة الثالثة : اعطاء ٥٠٪ فقط من احتياجات الطائر من الغذاء •

أدى نظامى تجديد العلف خلال فترة النمو (٦ ــ ٢٠) الى تأخير النضج الجنسى فى كل من الفيومى والروس • حدث توفير فى كمية العلف المستهلك بنسبة ٤٤٪ فى نظام ٥٠٪ علف ، ٢٠٪ فى نظام صيام يوم وغذاء يوم •

لم يؤثر نظامى تحديد العلف على صفات عدد البيض ــ حجم البيضة فى كلا النوعين • بحساب العائد المادى وجد أنه افضل فى حالة التغذية طول الوقت عنه فى كلا نظامى التغذية المحددة خلال فترة النمو •

طيور الروس كانت أفضل من الفيومى فى صفات وزن الجسم ــ النضج الجنسى ــ عدد البيض ــ وزن البيضة ــ التحويل الغذائى ــ العائد المادى •