Egypt. J. Anim. Prod. 24, No. 1—2 pp. 23-29 (1984)

The Effect of Restricted Feeding During the Growing Period on Egg Quality, Reproductive Organs, Endocrine Glands and Some Internal Organs of Ross of Tint and Fayoume Laying Hens

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

Anim. Prod. Dept., Fac. Agric., Cairo Univ. and Tanta Univ., Egypt.

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 environmental conditions. From 6-20 weeks of age all females reared on three different systems of feeding 1. Full-feda 2. Skip-a-day, 3. 50 % diet. From 21-54 weeks of age, all treatments were switched to layer diet which were provided *ad lib.* At 30, 42 and 54 weeks of age 10 eggs were collected randomly daily from each treatment in three subsequent days for determination egg quality. At 32 weeks of age 7 birds were taken from each treatment and sacrificed. Weights of reproductive organs, Endocrine glands and some internal organs were studied.

The type of feeding program during the growing period did not affect significantly the specific gravity, albumen weight %, yolk weight % and the shape index. / However, there were significant differences among treatments on Haugh unit, shell weight % and shell thickness. 50% diet program : reduced shell weight% and shell thickness significantly for Ross Tint and Fayoumi eggs. The reproductive organs (oviduct, ovary and ovum) had not been significantly affected by the different feeding systems. The restricted feed increased significantly the Adrenal and Pitutary glands of Fayoumi pullets, decreased the Pitutary gland of Ross Tint. The restricted program increased but not significantly the weight of liver, gizzard and pancreas for the two breeds.

As a matter of fact, the aim of those who support the restricted feeding program is that to allow the birds to develop a larger reproductive organs which in turn results in larger initial and maintained egg weight. Studies has occurred regarding the effect of restricted feeding upon various characters of the fowl. Aitken *et al.* (1972) reported that a significant genotype × dietary protein level interaction were observed for egg weight, albumen quality and feed consumption.

Pepper *et al.* (1959) found little or no differences in quality between eggs produced by birds reared on high or low energy diets. Fuller and Dunahoo (1962) found also no differences in egg shell thickness or Haugh unit

values of eggs when the restricted feeding birds has been in production for 12 months. However, Proundfoot and Gowa (1967) found that Haugh unit values were higher for the light treated birds wich reared under restricted feeding program.

The present study was conducted to investigate the effect of the feed restricting program during the period from 6-20 weeks of age on egg quality, weight of reproductive organs, weight of Endocrine glands and weight of some internal organs of Ross Tint and Fayoumi laying hens.

Material and Methods

This 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 conditions. They were fed *ad libitum* on diet containing 16.92% crude protein and 2613 kcal M.E. / kg diet. At six weeks of age, sexing was carried out and only females were used in the study. On May, 9, 1979 until August 15, 1979 (6-20) wks.), all females reared on three different systmes of feeding : 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 weee 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.* 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. Feed and water were provided *ad lib.* The day light has been increased artificially to be 17 hr daily. At 30, 42, and 54 weeks of age 10 eggs were collected randomly daily from each of the six treatments in three subsequent days for determination specific gravity, Haugh unit, albumen weight percent, yolk weight percent, shell weight percent, shell thickness and shape index.

At 32 weeks of age 7 birds were randomly taken from each treatment weighed alive before feeding and sacrificed. The ovary and the oviduct were separated and weighed. The visible oocytes were counted under a binocular. The diameter of visible oocytes were recorded according to 1. under 1 mm, 2. ranging from 1mm to 1cm., 3. over 1cm. The internal organs (liver, gizzard, pancrease and spleen) were separated and weighed. Thyroid, Adrenal and Pituitary glands were separated and weighed to the nearest gram.

Two ways classification analysis of variance were performed to measure the significance of differences for egg quality parameters, values of reproductive systems, values of Endocrine glands and values of the internal organs. Duncan's multiple range tests (Snedecor and Cochran 1967) were applied to separate the means when statistical significance was found.

Results and Discussion

1· *Egg quality*

Mean values of egg quality are presented in Table 1. The type of feeding program during the growing period did not affect significantly the specific gravity, albumen weight percent, yolk weight percent and the shape index. However, there were significant differences among treatments on Haugh unit, shell weight percent and shell thickenss. Birds Full-fed during the growing period produced eggs with higher Haugh unit scores than those reared on Skip-a-day program for Ross Tint in all ages and only at 30 weeks of age for Fayoumi. 50% diet program reduced shell weight percent and shell thickness significantly for Ross Tint and Fayoumi compares with the other two treatments.

Age and type of breed affected significantly specific gravity, Haugh unit, albumen weight %, yolk weight %, shell weight %, shell thickness and shape index. Table 1 show that the specific gravity, Haugh unit, shell weight % and shell thickness decreased singificantly with the advance of age with the two breeds. In all ages, changes in albumen weight percentage would be the base of the changes in Yolk weight percentage. Fayoumi eggs had more shell weight and shell thickness than Ross Tint. Perek and Snapir (1970) , Ronald (1976) and Hamilton (1978) observed also the decrease of shell weight due to age Hamilton (1978) and Potts *et al.* (1974) had also a significant influence on shape index due to strains.

2· *Reproductive organs*

The absolute and relative weights of the reproductive organs of Ross Tint and Fayoumi females at 32 weeks of age are presented in Table 2. The reproductive organs (oviduct, ovary and ovum) had not been significantly affected by the different feeding systems. These organs were lighter for Fayoumi than Ross Tint. There is no difference between the two breeds in the number of ovum more than 1cc, but more number of ovum from 1 cc to mm 1 for Fayoumi and more number of ovum less than 1 mm for Ross Tint.

3· *Endocrine glands*

The relationship between the Endocrine glands and the body weight are summarised in Table 3. The statistical analysis not reveal any difference between breeds for Thyroid gland and Adrenal gland. The restricted feed increased significantly the Adrenal and Pituitary glands of Fayoumi pullets decreased the Pituitary gland of Ross Tint.

TABLE 1. Egg quality values produced by Ross Tint hens raised on restricted feeding during the growing period.

Treatment	Age in wks	S.G.	U.H.	A.W.%	Y.W,%	S.W.%	S.T.	S.I.
		a	a	a	a	a	a	a
Full-fed	30	1.095	98.30	59.46	33.16	10.10	39.27	76.03
		ab	cd	b	b	b	b	a
	42	1.092	92.87	65.30	30.09	9.07	38.20	75.56
		c	f	c	c	c	c	a
	54	1.087	89.63	62.70	31.73	9.57	36.50	75.26
Avg.		1.091	93.60	62.50	31.70	9.58	37.99	75.26
		a	b	a	a	a	a	a
Skip-a-day	30	1.096	96.53	59.76	33.47	10.43	39.63	75.07
		b	b	d	d	b	b	a
	42	1.091	90.87	66.03	29.47	9.36	38.23	74.77
		b	g	b	b	b	b	a
	45	1.090	86.00	64.06	30.88	9.53	37.86	75.00
Avge.		1.092	91.00	62.30	31.30	9.77	38.57	74.95
		ab	c	e	e	a	c	a
50% diet	30	1.093	93.87	61.06	32.62	10.00	36.37	76.62
		c	b	d	d	c	d	a
	42	1.088	96.10	67.00	29.35	9.83	27.00	73.43
		c	f	b	b	c	e	a
	45	1.087	89.67	64.13	30.92	8.90	53.80	75.08
Avge.		1.089	92.30	64.10	31.00	9.28	36.39	74.92

Egg quality values produced by Fayoumi hens

		d	dc	c	b	d	f	b
Full-fed	30	1.102	91.83	62.63	30.87	11.03	40.76	77.53
		e	g	a	a	a	b	b
	42	1.097	86.83	59.60	33.42	9.93	38.13	77.33
		ab	h	a	f	ab	b	b
	45	1.092	84.03	59.10	34.04	9.57	37.60	77.10
Avge.		1.97	87.60	60.40	32.80	10.18	38.83	77.32
		d	f	c	c	a	f	b
Skip-a-day	30	1.100	89.23	62.26	31.03	10.60	40.93	78.54
		e	g	a	f	b	b	b
	42	1.098	86.93	58.96	34.07	9.63	38.43	78.16
		e	h	a	f	b	b	b
	54	1.096	84.03	59.16	34.40	9.66	38.46	77.10
Avg.		1.098	86.73	60.10	33.10	9.69	39.27	77.89
		d	d	c	c	a	a	b
50% diet	30	1.099	92.10	62.30	31.50	10.33	39.53	78.20
		d	f	a	f	b	b	b
	42	1.099	89.07	56.66	34.30	9.56	38.50	78.16
		ab	i	a	f	b	d	b
	54	1.093	82.40	59.56	34.05	9.36	37.16	77.73
Av .		1.097	87.90	60.2	33.30	9.75	38.40	78.03

a b c d e f g h i values within the same column followed by a different letter are significantly different ($p \leq 0.05$).

S.G. (specific gravity) ; H.U. (Haugh unit); A.W. % (Albumen weight %);

Y.W. % (Yolk weight)% ; S.W. %(Shell weight%) ; S.T. (Shell thickness) and S.I. Shape. index).

TABLE 2. Absolute and relative weights of the reproductive organs of Ross Tint and Fayoumi hens at 32 weeks of age.

Organs	Ross Tint			Fayoumi		
	Fullfed	Skip-a—day	50% diet	Fullfed	Skip-a—day	50% diet
Oviduct wt. abs. (gm)	a 50.34	a 46.57	a 47.73	b 39.36	b 36.90	b 36.37
Oviduct. wt, to body wt. %	a 2.94	a 2.87	a 3.02	b 2.68	b 2.72	b 2.50
Ovary wt. Abs. (gm)	a 45.16	a 30.27	a 41.07	b 38.33	b 36.46	b 38.73
Ovary wt. to body wt.%	2.49	2.48	2.59	2.61	2.76	2.77
No. Ovum> lcc	5.57 a	4.14 a	4.29 a	4.86 b	4.86 b	5.14 b
No. Ovum lcc to 1mm	34.00	30.40	28.00	46.86	44.86	54.43
No. Ovum< 1mm	a 1125.86	a 1103.57	a 1109.57	b 810.14	b 818.86	b 799.43

a b values within the same raw followed by a different letter are significantly different ($P \leq 0.01$).

TABLE 3. Absolute and relative weights of the Endocrine glands of Ross Tint and Fayoumi hens at 32 weeks of age.

Endocrine glands	Ross Tint			Fayoumi		
	Fullfed	Skip-a day	50% diet	Fullfed	Skip-a day	50% diet
Thyroid gl. Abs. wt. (mg)	100.86	103.14	94.71	101.43	94.57	93.43
Thyroid gl. to body Wt. (10—3)%	5.90	6.35	5.32	6.88	6.68	6.38
Adrenal gl. Abs. Wt. (mg)	130.57	117.71	118.28	105.43	125.71	123.57
Adrenal gl. to body wt. (10-3%)	a 7.20	a 7.29	a 7.43	b 7.18	b 9.34	b 8.45
Pituitary gl. Abs. wt. (mg)	a 11.14	b 8.00	c 10.00	b 7.71	c 9.00	b 8.00
Pituitary gl. to body wt. (10-3)%	a 0.61	b 0.50	a 0.64	b 0.53	a 6.66	b 0.65

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

4. *Some internal organs*

The data in Table 4 shows the effect of the feeding systems during the growing period on some certain organs. Liver, pancreas and spleen were significantly heavier for Fayoumi than Ross Tint, while gizzard was heavier for Ross Tint. The restricted program increased but not significantly the weight of liver, gizzard and pancreas for the two breeds.

TABLE 4. **Absolute and relative weights of some internal organs of Ross Tint and Fayoumi hens at 32 weeks of age.**

Internal organs	Ross Tint			Fayoumi		
	Fullfed	Skip-a day	50 % diet	Fullfed	Skip-a-day	50 % diet
Liver	a	a	a	b	b	b
Abs. wt. (gm)	26.60	25.30	24.40	28.85	29.71	34.30
Liver wt. to	a	a	a	b	b	b
body. wt. %	1.47	1.53	1.54	1.96	2.19	2.36
Gizzard	a	a	a	b	b	b
Abs. wt. (gm)	46.27	44.40	43.55	35.93	35.43	37.10
Gizzard wt. to body wt. %	2.56	2.75	2.77	2.45	2.61	2.55
Pancreas	a	a	a	b	b	b
Abs. wt. (gm)	2.80	2.80	2.60	2.23	3.51	3.51
Pancreas wt. to	a	a	a	b	b	b
body w. %	0.16	0.17	0.16	0.22	0.26	0.24
Spleen	a	a	a	b	b	b
Abs. wt. (gm)	1.50	2.12	1.53	2.29	2.26	2.36
Spleen wt. to	a	a	a	b	b	b
body wt. %	0.08	0.12	0.10	0.16	0.17	0.16

a b values within the same raw followed by a different letter significantly different ($P \leq 0.05$).

References

Aitken, J.R., Biely, J., Nikolaiczuk, N., Robblee, A.R., Summers, J.D. and Barr, W.K. (1972). Genotype x Dietary protein level interactions in egg production stocks. *poultry Sci.* **51**. 1578.

Fuller, H.L. and Dunahoo, W.S. (1962). Restriction feeding of pullets. 2-Effect of duration and time of restriction on three -year laying house performance *Poultry Sci.*, **41**, 1306.

Hamilton, R.M.G. (1978). Observations on the changes in physical characteristics that influence egg shell quality in ten strains of White Leghorns. *Poultry Sci.*, **57**, 1192.

Pepper, W.F., Slinger, S.J., Orr, H.L. and Sayder, E.S. (1959).Effect of high and low energy diet and range versus confinement rearing on egg production and quality of fresh and held eggs. *Poultry Sci.*, **38** 379.

Perek, M and Saapir, N. (1970).Interrelationships between shell quality and egg production and egg and shell weights in white Leghorn and White Rock hens. *Brit.Poultry Sci.* 11, 133.

Potts, P.L. Washburn, K.W. and Hale K.K. (1974). Shell evaluation of white and bron egg strains by deformation, breaking strength, shell thickness and specific gravity. 2. Stepwise regression analysis of egg characteristics on methods of assessing shell strength. *Poultry Sci.* 53, 2167.

Proudfoot, T.G. and Gowe, R.S. (1976). The effect of photoperiodism and rearing period feed restriction on the performance of five Leghorn strains. *Poultry Sci.* 46, 1056.

Ronald, D.A., Sr, (1976). Recent developments in egg shell quality. *Foodstuffs* 48 (29)

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

تأثير تحديد الغذاء خلال فترة النمو على صفات البيض وبعض الغدد الصماء والجهاز التناسلى لدجاج الفيومى والروس

حامد نجم ، محمد جمال الدين قمر ، سوزان احمد رياض وانور منجود

كليتى الزراعة ، جامعتى القاهرة وطنطا ، مصر

بدات هذه الدراسة على ١٦٠٠ كتكوت فيومى وروس تمت حضانتهم من عمر يوم حتى عمر ٦ أسابيع تحت نفس الظروف العادية • عند عمر ٦ أسابيع أختت 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 •

ابتداء من عمر ٢١ ــ ٥٤ أسبوع ألغى نظام تحديد العلف وأعطيت جميع الطيور عليقة انتاجية بياض طول الوقت • لتحديد صفات البيض جمع ١٠ بيضات خلال ثلاثة أيام متتالية من كل مجموعة عند الأعمار ٣٠ ، ٤٢ ، ٥٤ أسبوعا • عند عمر ٣٢ أسبوع كانت توزن ٧ اناث عشوائيا من كل مجموعة وتذبح ثم توزن بعض الغدد الصماء والأعضاء التناسلية والأعضاء الداخلية •

وجد تأثير معنوى لنظامى تحديد العلف على صفات الجودة التالية ــ معامل البياض وزن القشرة ــ سمك القشرة بينما لم يلاحظ تأثير معنوى على كل من الصفات التالية الكثافة النوعية ــ وزن البياض ــ وزن الصفار ــ شكل البيضه• أدى نظام تحديد العلف ٥٠٪ الى خفض وزن القشرة وسمك القشرة معنويا لبيض كلا من الفيومى والروس •

لم يلاحظ تأثير معنوى نتيجة لنظامى تحديد العلف على كل من الأعضاء التناسلية (المبيض ــ البويضات ــ قناة المبيض) • أدى نظامى تحديد العلف الى زيادة معنوية فى الغدة النخامية والكظريتان فى دجاج الفيومى بينما لوحظ انخفاض فى وزن الغدة النخامية فى دجاج الروس • أدى نظامى تحديد العلف الى زيادة غير معنوية فى وزن الكبد ــ القونصة ــ البنكرياس لكلا من دجاج الفيومى والروس •