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EFFECT OF FEED RESTRICTION OF JAPANESE QUAIL UNDER NORTH SINAI CONDITIONS.
1- ON GROWTH PERFORMANCE

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ABSTRACT

This study was carried out in an attempt to improve Japanese quail productivity under north Sinai conditions using feed restriction technique. A total number of 600 one-week-old unsexed Japanese quail (*Coturnix coturnix japonica*) were divided into five treatments, each contained three replicates, of 40 birds per replicate. The experimental treatments are: T1, birds fed 100% of daily feed intake requirements; T2, birds fed 90% of daily feed intake requirements; T3, birds fed 80% of daily feed intake requirements; T4, birds fed 70% of daily feed intake requirements and T5, birds fed 60% of daily feed intake requirements .Weekly live body weight, puberty day and carcass measurements (carcass weight, ovary weight, oviduct weight, oviduct length) were recorded to the nearest 0.1 gm.

The results showed that, feed restriction linearly reduced body weight gain. It was noticed that feed restriction improved ($P<0.05$) feed conversion. While, these improvements were not significant ($P>0.05$) at periods 1 to 2, 2 to 3 and 4 to 5 weeks of age, but were significant ($P<0.05$) at periods 3 to 4, 5 to 6 and 1 to 6 weeks. Feed restriction reduced ($P<0.05$) (weight or percentage) of reproductive organs (ovary and oviduct). Total costs tended to decrease with increasing feed restriction. On the other hand, net revenue, economical efficiency and relative economic efficiency tended to increase by increasing restriction compared with the control.

Keywords: Japanese quail, restriction, growth performance, feed conversion efficiency.

INTRODUCTION

As a result of the genetic selection of broilers for increased growth rate and feed efficiency, it has become necessary to severely restrict feed intake of the broilers intended for breeding to enable them to survive into adulthood and reproduce successfully. Moreover, feed restriction for birds gives priority to the development of the supply organs of the body such as the stomach which is more important during early development at the expense of the demand tissues like breast and the thigh (Govaerts *et al.,* 2000).

Farm Animal Welfare Network (FAWN, 1996) reported that a female broiler breeder receives 52g of feed daily at 7 wks of age, while a commercial broiler (intended for slaughter at around 6-7 weeks) will consume 182g of feed daily. The impact of this restriction can be seen in the fact that at 7 wks of age a female breeder weighs 780g, while a female commercial broiler weighs around 2440g. Similarly, a male breeder receives 78g of feed daily at 7 weeks of age and weighs just 1100g, compared with a male commercial broiler of the same age that will consume 205g of feed and weigh around 2897g.

El-Hommosany *et. al*., (2003) studied the response of quail chicks to different quantitative feed restriction regimens. They found that the *ad libitum* (AL)-fed group grew faster and was significantly heavier until the 6th wk of age (WOA) compared to the other restricted feeding regimens. This group also had the highest (*P*=0.01) values of feed consumption throughout the growing period (1-4 weeks) followed by the 80% feed restriction; moreover restriction significantly improved feed conversion. The mild feed restriction at 80% of *ad lib* significantly decreased mortality rate from 1 to 4 WOA compared with the AL-fed or those given 70% of *ad lib* feed. The highest mortality rate was recorded in birds shifted from mild to severe feed restriction. Moreover, feed restriction delayed the age at first egg production depending on severity of the restriction.

Hassan *et al*., (2003), reported that body weight at first egg was significantly heavier for females fed 70% ad lib than for birds on other treatments. Feed restriction did not affect age at first egg and feed conversion efficiency,.

This study was carried out in an attempt to evaluate the effect of feed restriction at 90, 80, 70, and 60% of daily (100%) feed intake requirements on growing Japanese quail productivity to get the exact or the optimum feed intake of these birds under North Sinai conditions.

MATERIALS AND METHODS

The present work was conducted at Animal Production Department, Faculty of Environmental Agricultural Sciences, , El-Arish, North Sinai, Suez Canal University Egypt.

Experimental birds and Procedure:

A total number of 600 chick's one-week-old of unsexed Japanese quail (*Coturnix coturnix japonica*) was divided into 5 treatments (T1, T2, T3, T4 and T5) each in 3 replicates. Each replicate contained 40 birds. Treatments were assigned as fellows: - T1, birds were fed 100% of daily feed intake requirements (control), T2, birds were fed 90% of daily feed intake requirements, T3, birds were fed 80% of daily feed intake requirements, T4, birds were fed 70% of daily feed intake requirements and T5, birds were fed 60% of daily feed intake requirements. The experimental diets were formulated to cover the recommended feeding levels of nutrients as reported by NRC (1994). Composition and calculated analysis of basal diet were recorded in Table

Managements:

Throughout the experimental period, quails of all treatments were kept under the same managerial conditions. The birds were provided daily with their feed as previously mentioned for each treatment. Water was provided *ad libitum.* Standard and recommended light regime was applied throughout the two experimental period which lasted for 8 weeks.

Table 1 composition and calculated analysis of basal diet.

Ingredient	100%
Yellow corn	57.000
Soybean meal (44%)	30.452
Corn gluten meal (60%)	1.500
Limestone	0.500
Sodium chloride	0.250
Premix *	0.250
Protein concentrate**	10.000
Di-calcium-phosphate	0.000
DL-methionine	0.018
L-Lysine HCL	0.030
Total	100.00
Calculated analysis :	
Crude protein %	24.19
ME Kcal/Kg	2891.4
Ether extract %	5.727
Calcium %	0.990
Total P %	0.641
Available P %	0.402
Methionine %	0.503
Lysine %	1.304
Methionine + Cystine %	0.891
Cost for Kg (L.E.)	1.65

- **Each kilogram contains = Vit. A, 12000 I.U.; Vit. D3, 2000 I.U.; Vit. E, 10mg.; Vit. K3, 2mg.; Vit. B1, 1mg.; Vit. B2, 5mg.; Vit. B6, 1.5mg.; Vit. B12, 0.01mg.; Niacin acid, 30mg.; Pantothenic acid, 10mg.; Folic acid, 1mg.; Biotin, 0.05mg.; Choline chloride, 260mg.; Iron, 30mg.; Copper, 10mg.; Zinc, 50mg.; Manganese, 60mg.; Iodine, 1mg.; Selenium, 0.1mg. and 0.1mg. Cobalt.**

**** Pro.concentrate : Cp,48%.; ME,2450 kcal/kg .; Ca,7%.; A.P2.6%.; lysine 2.3% .; Methionine 1.44 %.; Methionine + Cystine 2.2 %.**

Methods of interpreting results:

Live body weight (BW) and feed consumption were recorded weekly, accordingly, feed conversion was calculated as average feed intake per chick per week / average body gain per chick per week. Chemical analysis was carried out according to A.O.A.C. (1990). Sexual maturity was considered on the age at first egg. At the end of the growing experimental period, nine female birds were taken randomly from each treatment (three birds from each replicate) to carry out slaughter measurements. Birds were fasted 12 hours before being slaughtered, weighed individually and then slaughtered. After completed bleeding, carcass, ovary and oviduct were weighed and oviduct length was measured. Accumulative mortality rate was calculated throughout all experimental period by subtracting number of live birds at the end of each period from the total number of birds at the beginning of the same period. Economical evaluation of was represented by calculating the feed cost needed to obtain one unit of production.

Statistical analysis:

Data were analyzed by analysis of variance procedures using General linear Models (GLM) procedure of SAS (1990). Differences among treatment means were separated by Duncan's Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

Live body weight:

Means of body weights of Japanese quail chicks raised under different levels of feed restriction regimens from 1 to 6 wks old are presented in Table 2. Results revealed that body weight was significantly affected by feed restriction. It appears that all dietary treatments have commenced with a nearly similar body weight at one week of age (85.58-32.17g), with no significant differences (P<0.05), so confirmed the appropriate of randomization procedure. This may create suitable condition to appraise the effect of feed restriction on the performance of quails during the subsequent periods of growth. Then after, the effect of feed restriction had significant (P<0.05) effect on body weight. For example, at week 2, body weight changes were 106.24, 92.65, 97.31 and 82.89% for chicks that received 90, 80, 70, and 60 % of the ad lib control, respectively. These data indicate that body weight is not only depending on the restriction level but also on the initial weight. It was observed that group of birds receiving 90% of the ad lib control one recorded higher body weights (P>0.05) than those of control. On the other hand, birds receiving 60% of the recommended feed (P<0.05) were lower in body weight, due to severe feed restriction. These results are in agreement with those obtained by Lee *et al.,* (1971) and Gous *et al.,* (2000). Similar trends were clearly observed throughout the subsequent weeks of growth period. It can be concluded that body size is greatly affected by feed restriction. Therefore, it is important to keep body size within certain limits in order to delay sexual maturity for layers and to provide the market with the required body weight of broilers. These results are consistent with those reported by Kwakkel *et al.,* (1993).

Table 2. Means ± SE of live body weight of Japanese quail raised under feed restriction regimes from 1 to 6 weeks old.

Treat. / Week	T1	T2	T3	T4	T5	Sig.
1	25.58±1.88	31.58±1.17	30.08±0.98	32.17±1.59	28.92±1.83	NS
2	52.08^{ab}±3.19	55.33^{a}±0.58	48.25^{b}±1.53	50.86^{ab}±0.56	43.17^{c}±1.01	**
3	104.62^{a}±4.44	104.67^{a}±0.30	96.33^{b} ±1.58	92.87^{b}±0.41	74.16^{c}±1.61	**
4	147.62^{a}±3.27	144.04^{a}±1.41	134.08^{b}±1.80	125.89^{c}±2.68	112.00^{d}±3.33	**
5	173.57^{a}±1.48	167.65^{ab}±1.46	153.83^{b}±1.80	135.34^{c}±3.48	125.57^{c}±11.35	**
6	194.30^{a}±2.45	188.56^{ab}±1.92	177.96^{b}±3.62	162.74^{c}±2.03	146.95^{d}±7.72	**

T1= (control) birds received 100% of daily feed intake requirements,
T2= birds received 90% of daily feed intake requirements,
T3= birds received 80% of daily feed intake requirements,
T4= birds received 70% of daily feed intake requirements and
T5= birds received 60% of daily feed intake requirements.
$^{a,b,...}$ = Means on the same row with different letters are differ significantly (P<0.05)
NS= insignificant differences (P>0.05),
****= highly significant differences (P< 0.01)**

Body weight gain:

Mean body weight gain of birds raised under different levels of feed restriction regimes from 1 to 6 weeks old are presented in Table 3. Results revealed that feed restriction linearly reduced body weight gain. The decline in body weight gain was due to the effect of feed restriction on the amount of feed intake. Lippens *et al.,* (2000) speculated that feed restriction in early life strongly affect (i.e. reduce) body weight gain. . Besides, the amount of feed intake, the full stomach capacity is known to affect the energy needed for body formation; enzymes activities and secretions and the optimum requirements for maintenance and growth. All, these factors can considerably affect body weight gain. These findings are in agreement with those of Wilson *et al.,* (1989); Robinson *et al.,* (1992); Kwakkel *et al.,* (1993) and Gous *et al.,* (2000).

Table 3 Means ± SE of body weight gain of Japanese quail raised under feed restriction regimes from 1 to 6 weeks old.

Treat. / Week	T1	T2	T3	T4	T5	Sig.
1 to 2	26.50^{a}±1.63	23.75^{a}±1.01	18.17^{b}±0.74	18.69^{b}±1.90	14.25^{b}±1.66	**
2 to 3	52.54^{a}±1.27	49.34^{a}±0.73	48.08^{a}±0.96	42.01^{b}±0.94	30.99^{c}±2.60	**
3 to 4	43.00±1.50	39.37±1.68	37.75±0.58	33.02±2.40	37.84±4.80	NS
4 to 5	25.95±2.14	23.61±0.47	19.75±3.54	9.45±1.30	13.57±8.02	NS
5 to 6	20.73±1.61	20.91±1.25	24.12±5.29	27.40±1.58	21.38±3.71	NS
1 to 6	168.72^{a}±1.09	156.97^{ab}±3.06	147.87^{b}±2.65	130.57^{c}±2.47	118.04^{d}±6.61	**

T1= (control) birds received 100% of daily feed intake requirements,
T2= birds received 90% of daily feed intake requirements,
T3= birds received 80% of daily feed intake requirements,
T4= birds received 70% of daily feed intake requirements and
T5= birds received 60% of daily feed intake requirements.
$^{a,b,...}$ = Means on the same row with different letters are differ significantly (P<0.05)
NS= insignificant differences (P>0.05),
****= highly significant differences (P< 0.01)**

Feed conversion:

Calculated data on feed conversion are presented in Table 4. Results indicate that treatments tended to affect (P≥0.05) feed conversion at periods 1 to 2, 2 to 3 and 4 to 5 weeks, however, data obtained showed that feed restriction improved (P<0.05) feed conversion. . at periods 3 to 4, 5 to 6 and 1to 6 weeks of age. The explanation for this finding is that the birds showed physiological ability to compensate for less food intake by increasing digestion rate. These results agree with those obtained by Molison *et al.,* (1984); Jones and Farrell (1987); Jones and Farrell (1989); Santoso *et al.,* (1995); Atasoy (1997); Gonzales *et al.,* (1998); Allan *et al.,* (1998); Niu-Shulin *et al.,* (1999) and Fontana *et al.,* (1992). But disagree with these of Govaerts *et al.,* (2000) and Pokniak *et al.,* (1984) with energy-protein restriction and subsequent refereeing system,

Table 4. Means ± SE of feed conversion of Japanese quail raised under feed restriction regimes from 1 to 6 weeks old.

Week \ Treat.	T1	T2	T3	T4	T5	Sig.
1 to 2	2.59±0.17	2.59±0.11	3.01±0.13	2.60±0.26	2.94±0.32	NS
2 to 3	2.14±0.05	2.05±0.03	1.87±0.04	1.87±0.04	2.2±0.18	NS
3 to 4	3.33^{a}±0.12	3.28^{a}±0.15	3.03^{a}±0.05	3.06^{a}±0.21	2.34^{b}±0.29	*
4 to 5	6.67±0.56	6.51±0.13	7.46±1.54	13.22±2.11	17.38±10.02	NS
5 to 6	9.48^{a}±0.68	8.43^{ab}±0.51	7.03^{abc}±1.34	5.00^{c}±0.30	5.84^{bc}±1.13	*
1 to 6	4.08^{a}±0.03	3.95^{ab}±0.08	3.73^{bc}±0.07	3.69^{bc}±0.07	3.52^{c}±0.19	*

T1= (control) birds received 100% of daily feed intake requirements,
T2= birds received 90% of daily feed intake requirements,
T3= birds received 80% of daily feed intake requirements,
T4= birds received 70% of daily feed intake requirements and
T5= birds received 60% of daily feed intake requirements.
$^{a,b,...}$ = Means on the same row with different letters are differ significantly (P<0.05)
NS= insignificant differences (P>0.05),
***= significant differences (P< 0.05)**

Reproductive internal organs measurements:

Data on reproductive internal organs measurements are presented in Table 5.

Table 5. Means ± SE of some reproductive internal organs measurements of Japanese quail as affected by feed restriction.

Variable \ Treatment	T1	T2	T3	T4	T5	Sig.
Live body weight (g)	236.26^{ab}±6.67	242.81^{a}±8.20	220.02^{bc}±6.28	195.44^{d}±3.90	204.54^{cd}±6.06	**
Ovary weight (g)	6.92^{a}±0.63	7.92^{a}±0.56	7.24^{a}±0.50	4.84^{b}±0.80	4.40^{b}±1.15	**
Ovary percentage %	2.93±0.24	3.26±0.22	3.29±0.19	2.47±0.41	2.08±0.50	NS
Transformed ovary percentage %	1.70^{a}±0.07	1.80^{a}±0.06	1.81^{a}±0.05	1.51^{ab}±0.16	1.32^{b}±0.20	*
Oviduct weight (g)	7.97^{a}±0.39	7.13^{a}±0.36	6.77^{a}±0.67	5.13^{b}±0.63	4.58^{b}±0.79	**
Oviduct length (cm)	35.92^{a}±0.61	35.50^{a}±1.07	34.61^{a}±1.21	27.28^{b}±2.00	23.07^{b}±2.51	**
Oviduct weight percentage %	3.40^{a}±0.21	2.94^{ab}±0.10	3.07^{a}±0.28	2.60^{ab}±0.30	2.20^{b}±0.37	*
Transformed Oviduct percentage %	1.84±0.06	1.71±0.03	1.74±0.08	1.57±0.12	1.40±0.17	NS

T1= (control) birds received 100% of daily feed intake requirements
T2= birds received 90% of daily feed intake requirements,
T3= birds received 80% of daily feed intake requirements,
T4= birds received 70% of daily feed intake requirements and
T5= birds received 60% of daily feed intake requirements.
$^{a,b,...}$ = Means on the same row with different letters are differ significantly (P<0.05)
NS= insignificant differences (P>0.05),
****= highly significant differences (P< 0.01)**

Data revealed that live body weight as previously mentioned was significantly affected by treatments. However, ovary weight, percentage of ovary weight and ovary weight cusine values indicated that the significant decline (P<0.05) in these values were only for group of birds that received 60% feed intake compared with the ad lib control one. Data on oviduct weight, oviduct length, oviduct weight percentage and oviduct cusine values are also shown in Table 5. Results indicated that there was a significantly decline in treatment 5 for birds receiving 60 % feed intake compared to the ad lib fed birds. However, in birds feed 70% and 60% of the control group, there was only a significant decline in the oviduct weight and length. These findings are in agreement with those of Fattori *et al.,*(1993) and Bruggeman *et al.,* (1999).

The decline in ovary and oviduct measurements due to severe feed restriction could positively affect the reproductive performance thereafter.

Sexual maturity:

Age at sexual maturity (days) of Japanese quail chicks of different treatments are presented in Table 6. It is clear that increasing feed restriction level resulted in significant (P<0.01) delay of sexual maturity. Decreasing feed allowance by 10, 20, 30 and 40% delayed sexual maturity by about 2, 5, 12 and 80 days, compared with the control. These results are in agreement with Dunn and Sharp (1992) and Gous *et al.,* (2000). Dunnington and Siegel (1984) and Summers *et al.,*(1987) who stated that it is profitable for a young hen to probably attain a minimum body size in combination with a particular body composition in order to initiate sexual maturity as well as egg production thereafter.

Table 6. Means ± SE of sexual maturity as affected by feed restriction level.

Treatment	**sexual maturity (days)**
T1 (Control)	39.00 ^{a} ±0.58
T2	41.33 ^{ab} ±0.33
T3	44.00 ^{b} ±0.58
T4	51.67 ^{c} ±2.03
T5	59.67 ^{d} ±2.03

T1= (control) birds received 100% of daily feed intake requirements,
T2= birds received 90% of daily feed intake requirements,
T3= birds received 80% of daily feed intake requirements,
T4= birds received 70% of daily feed intake requirements and
T5= birds received 60% of daily feed intake requirements.
$^{a,b,...}$ = Means on the same column with different letters are differ significantly (P<0.05)

In the present study, feed restriction strongly affected body size and caused a significant (P<0.05) reduction in reproductive organs (ovary and oviduct). Therefore, it could be stated that the onset of maturity is not only related to the degree of feed restriction but depend also on the age of pullets (Burgess, 1986 and Gous *et al.,* 2000**)**.

Mortality:

Few numbers of birds were died during all the experimental periods indicating that restriction had no effect on mortality.

Economic efficiency:

The economic efficiency of different treatments during the experimental period (1-6 weeks of age) for Japanese quails is shown in Table 7.

Table 7. Economic efficiency of experimental Japanese quails reared under different feeding restriction level (1-6 weeks) .

Item	Treatment				
	T1	T2	T3	T4	T5
Feed intake/quail hen (Kg)	0.69	0.62	0.55	0.48	0.41
Price / Kg Feed (L.E.)	1.65	1.65	1.65	1.65	1.65
Cost of feed (L.E.)	1.14	1.02	0.91	0.80	0.68
Fixed cost (L.E.)	0.50	0.50	0.50	0.50	0.50
Total cost (L.E.)	1.64	1.52	1.41	1.30	1.18
Price of bird (L.E.)	3.00	3.00	3.00	3.00	3.00
Net revenue	1.36	1.48	1.59	1.70	1.82
Economic efficiency*	0.83	0.97	1.13	1.31	1.54
Relative economic efficiency**	100.00	116.45	135.56	158.03	184.82

*** Net revenue per unit cost.**
**** Assuming that the treatment number 1 represent the control.**
T1= (control) birds received 100% of daily feed intake requirements,
T2= birds received 90% of daily feed intake requirements,
T3= birds received 80% of daily feed intake requirements,
T4= birds received 70% of daily feed intake requirements and
T5= birds received 60% of daily feed intake requirements.

The economical efficiency values were calculated according to the total cost (feed cost + fixed cost) and the prevailing market (selling) price of slaughtered bird, which was 3.0 LE on average during the experimental period. Data in Table 7. showed that, total cost was declined as feed restriction increased .Oppositely, net revenue, economical efficiency and relative economic efficiency were all increased with the increase of feed restriction compared with the ad lib control birds.

- **In conclusion Using feed restriction regime at 90% daily feed intake level for Japanese quail under North Sinai conditions.**

REFERENCES

Allan, O., S. Ozkan, and S. Yalcin. 1998. Restricted growth of broilers. Effect of different feeding programs on broiler performance and carcass characteristics. Turk. Veterinerlik. Ve. Hayvancilik. Dergisi. 22: 231-236. (Abstr.).

A.O.A.C. 1990. Association of Official Analytical Chemists. Official Method of Analysis. 15th Edition. A. O. A. C., Washington, D.C., USA.

Atasoy, F. 1997. Effect of rearing the sexes separately and early feed restriction on broiler performance. Veteriner Fakultesi Dergisi, Ankara Universitesi. 44: 215-223. (Abstr.).

Bruggeman, V., O. Onagbesan, E. D'Hondt, N. Buys, M. Safi, D. Vanmontfort, L. Berghman, F. Vandesande, and E. Decuypere. 1999.

Effects of timing and duration of feed restriction during rearing on reproductive characteristics in broiler breeder females. Poultry Sci., 78:1424-1434.

Burgess, A. D. (1986). Food restriction, growth and carcass composition of pullets. Ph.D. Thesis, University of Nottingham.

Duncan, D. B. (1955). Multiple range and multiple F-tests. Biometrics. 11: 1-42.

Dunn, I. C. and P. J. Sharp (1992). The effect of photoperiodic history on egg laying in dwarf broiler hens. Poultry Science, 71: 2090-2098.

Dunnington, E. A., and P. B. Siegel (1984). Age and body weight at sexual maturity in female White Leghorn chickens. Poultry Sci., 63:828-830.

El-Hommosany, Y. M., , S. A. Abdel-Fattah, M. F. M. Ali, (2003). Response of quail chicks to different quantitative feed restriction regimens: productive, immunological and physiological aspects. Egyptian Poultry Science Journal, (Vol. 23) (No. 2) 421-440

Fattori, T. R.; H. R. Wilson; R. H. Harms; F. B. Mather; R. D. Miles, and G. D. Butcher (1993). Response of Broiler Breeder Females to Feed Restriction Below Recommended Levels: 3. Characterizing the Onset of Sexual Maturity. Poultry Science, 72:2044-2051

FAWN (1996) Broiler breeders. A Farm Animal Welfare Network factsheet, March 1996.

Fontana, E. A.; W. D. Weaver, Jr.; B. A. Watkins and D. M. Denbow (1992). Effect of early feed restriction on growth, feed conversion and mortality in broiler chickens. Poultry Sci., 71: 1296-1305.

Gonzales, E., J. Buyse, M. M. Loddi, T. S. Takita, N. Buys, and E. Decuypere. 1998. Performance, incidence of metabolic disturbances and endocrine variables of food-restricted male broiler chickens. Br. Poult. Sci., 39:671-678.

Gous, R. M.; G. D. Bradford; S. A. Johnston and T. R. Morris1(2000). Effect of age of release from light or food restriction on age at sexual maturity and egg production of laying pullets. British poultry Science, 41: 263-271

Govaerts, T.; G. Room, J. Buyse, M. Lippens, G. DE Groote and E. Decuypere (2000). Early and temporary quantitative food restriction of broiler chickens. 2. Effects on allometric growth and growth hormone secretion. British Poultry Science, 41; 355-362.

Hassan SM; M.E. Mady; A.L.Cartwright ; H.M.Sabri; M.S. Mobarak (2003). Effect of early feed restriction on reproductive performance in Japanese quail (Coturnix coturnix japonica). Poult Sci. , 82(7):1163-9

Jones, G. P. D., and D. J. Farrell. 1987. Reducing body fat in broilers: preliminary results. Recent advances in Anim. Nutri. in Australia, 211-221.

Jones, G. P. D., and D. J. Farrell. 1989. Reducing body fat in broiler chickens and some physiological consequences. South African J. Anim. Sci., 19:179-183.

Kwakkel, R. P., B. J. Ducro, and W. J. Koops, 1993. Multiphasic analysis of growth of the body and its chemical components in White Leghorn pullets. Poultry Sci., 72:1421-1432.

Lee, P. J. W.; Gulliver, A. L. and Morris, T. R. (1971). A quantitative analysis of the literature concerning the restricted feeding of growing pullets. British Poultry Science, 12: 413-437.

Lippens, M., G. Room, G., DE Groote and E. Decuypere, (2000). Early and temporary quantitative food restriction of broiler chickens. I. Effectes on performance characteristics mortality and meat quality. British Poultry Science, 41: 343-354.

Molison, B.; W. Guenter and B. R. Boycott (1984). Abdominal fat deposition and sudden death syndrome in broilers: The effect of restricted feed intake early life caloric (fat) restriction, and calorie : protein ratio. Poultry Sci., 63: 1190-1200.

Niu Shulin, Liu JinBo, Gao HongWei, Hou WanWen, and Tian TiaLiang. 1999. Effect of different methods of restricted feeding on performance of AA broilers. Chin. J. Anim. Sci., 35: 27-28. (Abstr.).

NRC. 1994. Nutrient Requirement of Poultry. 9th rev. Edition. National Academy Press, Washington, DC.

Pokniak, J. A.; M. S. Avaria and S. B. Cornejo (1984). Productive performance and changes in Carcass composition of broilers under an initial energy-protein restriction and subsequent refeeding (1). Nutr. Rep. Int., 30: 1377-1383.

Robinson, F. E.; H. L. Classen; J. A. Hanson and D. K. Onderka (1992). Growth performance, feed efficiency and the incidence of skeletal and metabolic disease in full-fed and feed restricted broiler and roaster chickens. J. Appl. Poultry Res., 1: 33-41.

Santoso, U., K. Tanaka, and S. Ohtani. 1995. Early skip-a-day feeding of female broiler chicks fed high-protein realimentation diets: Performance and body composition. Poultry Sci., 74: 494-501.

SAS Institute, 1990. SAS/STAT® Guide for Personal Computers. Version 6.03 Edition. SAS Institute Inc., Gary, NC.

Summers, J. D., S. Leeson, and D. Spratt, 1987. Rearing early maturing pullets. Poultry Sci., 66:1750-1757.

Wilson, H. R.; D. R. Ingram.; F. B. Mather, and R. H. Harms (1989). Effect of Daily Restriction and Age at Initiation of a Skip-A-Day Program for Young Broiler Breeders. Poultry Science, 68:1442-1446.

تأثير تحديد التغذيه للسمان الياباني النامي تحت ظروف شمال سيناء
١- على بعض الصفات الإنتاجية

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أجريت هذه الدراسة بغرض تحسين إنتاجية السمان الياباني عن طريق تأخير العمر عند النضج الجنسي وذلك باستخدام طريقة تحديد كمية الغذاء المأكول وقد تم استخدام ٦٠٠ طائر سمان من عمر اسبوع الى عمر ٦ اسابيع قسمت الى ٥ معاملات (كنترول و ٩٠ و ٨٠ و ٧٠ و ٦٠ % من الغذاء الماكول بواسطة الكنترول) وقد شملت قياسات الدراسة كل من معدلات النمو والمأكول من الغذاء والكفاءة التحويلية للغذاء ا ,أوزان بعض الأعضاء في الذبيحة وعمر النضج الجنسى والكفاءة الاقتصادية للمعاملات المختلفة .

ويمكن تلخيص النتائج المتحصل عليها كالتالي :

1- حدث انخفاض في وزن الجسم نتيجة تحديد كمية الغذاء المأكول في الفترة من ١- ٦ أسابيع وكان أكثرها تأثرا المجموعة التي أعطيت ٦٠% من الكنترول.
2- لم تظهر أى فروق معنوية في قيم كفاءة التحويل الغذائي في الفترات (من الأسبوع الأول للثاني ومن الثاني للثالث ومن الرابع للخامس . بينما كانت هناك فروق معنوية في الفترات من الأسبوع الثالث للرابع ومن الخامس للسادس وكذلك من الأسبوع الأول للسادس.
3- تأخر عمر النضج الجنسي بزيادة نسبة تحديد الغذاء وكان التأثير معنويا مقارنا بمجموعة (الكنترول).
4- انخفضت التكاليف الكلية مع مستوي تحديد الغذاء انخفاضا طرديا ، وازداد العائد الاقتصادي والكفاءة الاقتصادية المطلقة والنسبية زيادة طردية مع تحديد الغذاء مقارنة بالكنترول.

مما سبق يتضح انه يمكن تحديد كمية الغذاء لطيور السمان الياباني من الأسبوع الثالث حيث يتأخر عمر النضج الجنسي وتقل التكلفة الكلية ويزداد العائد الاقتصادي