Egypt. J. Anim. Prod., 15, No. 2, pp.163-172 (1975)

Growth of Male and Female Dokki – 4 Chicks as Influenced by Iodine Additives

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Four hundreds and fifty one-day old Dokki-4 chicks, were raised, on a basal ration till 8 weeks of age. Thereafter they were classified into two categories: normally - and subnormally - growing chick. Trial 1 was carried out on the normally-growing chicks which received one of the following iodine levels in their diets: 279, 679. or 1079 ppb. Whereas Trial 2 was carried out on the subnormally growing individuals which received either 279 or 679 ppb iodinse.

Supplying the ration with iodine additives to provide 679 ppb iodine improved body weight and gain of normally-growing males at 24 weeks of age. However, a level of 279 ppb iodine was sufficient for optimum growth of normally-growing females till the same age. High iodine contents (1079 ppb) seemed to impair growth of both sexes at certain periods of growth. Elevating the level of iodine in the diet of subnormally-growing chicks to 679 ppb stimulated growth of females but not of males at 24 weeks of age.

The iodine requirement was studied over several generations by Wilgus *et al.* (1953) and 440 ppb was set as a minimum for the growing chick. Godfrey *et al.* (1953) were unable to produce a statistically significant reduction in chick growth with a diet that contained as little as 30 ppb iodine. Moreover, normal body growth was supported by 75 ppb dietary iodine as reported by Creek *et al.* (1957). In 1966. The National Research Council has suggested 350-400 ppb iodine for optimal growth in chicks.

Because of the apparent differences in iodine requirements reported by different investigators, it was decided to conduct further studies on the effect of iodine level in the diet on the growth of normally- and subnormally- growing chicks under local environmental and dietary conditions.

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Material and Methods

Four hundreds and fifty one-day old Dokki-4 chicks were vaccinated, wing -banded and weighed. They were maintained in floor brooders and fed a basal ration for a period of 8 weeks. Thereafter, the birds were classified into two classes : normally and subnormally -growing chicks. The average live body weight of the latter class was more than 100 g below that of the former one.

Two different feeding trials were carried out with both classes till the the age of 24 weeks. Triral 1 was set up with these chicks of normal growth, which were further divided into three groups numbered 1,2 and 3. Group 1 (control) was fed, throughout the expermimental period, a basal ration contained 279 ppb iodine, whereas groups 2 and 3 were fed the same basal ration supplemented with iodine additives at the levels of 400 and 800 ppb making a total of 679 and 1079 ppb, respectively. Trial 2 was carried out with the subnormal -growing chicks, which were divided into two groups : A and B. Group A (control) was fed the same basal ration of Trial 1, while group B was fed the basal ration supplemented with 0.4 mg iodine per kg ration. The iodine additives were supplied from a stock Lugol's solution (5 g elemental iodine + 10 g potassium iodide / 100 ml distilled water). The rations were mixed with Lugol's solution weekly to overcome the problem of iodine unstability, and all groups of chicks were given free access to water and to their respective diets.

The individual weights of chicks of both trials were taken at biweekly intervals. The averages live body weight of the different groups within each trial were statistically similar at the begining of the treatment. Two, three and six male and female chicks from each group at 16,20 and 24 weeks of age respectively, were sacrificed and the weight of paired thyroid glands were determined The composition of the basal ration used in this investigation was as follows :

Ingredients	%
Ground corn	50
Wheat bran	24
Decorticated cottonseed meal	10
Horse beans	5
Protelan	5
Blood meal	3
Limestone	2.5
Common salt	0.5
Vitamin premix ($A+D_3$)*	0.1
Calculated analyses** :	
Crude protein, %	17.56
Metablolizable energy, Kcal/Kg	2714
C/P ratio	154

* Vitamin premix contained 5000 I.U, vit. A and 500 I.U. vit. D_3 /g.

** Calculated analyses : values were calculated according to Ewing (1953).

The procedure of Barakat *et al* (1968) was used for the iodine determination in the basal ration. The obtained data were subjected to statistical analyses including comparisons of means using test as outlined in Snedecor and Cochran (1967).

Results and Discussion

A summary of the data on average live body weight and gain in both trials from 8 to 24 weeks of age is given in Tables 1 and 2. In regard to Trial 1, it was noticed that the male chicks of group 2 weighed less than their controls (group 1) at 12 weeks of age. However, they grew similarly from 14 to 20 weeks but abviously faster than their controls from 22 to 24 weeks of age . In the meantime, the live body weight and gain of males in groups 2 were significantly higher than those of males in groups 1 and 3 at 24-weeks old (Tables 1 and 4). The average weight of thyroid gland of males (either per chick or per 100 g body weight) at 20 and 24 weeks of age was significantly lower in group 2 than in group 1 and 3. As early as 10 weeks of age, the live body weight of males in group 2 was significantly heavier than that of males in group 3. This valuable difference prolonged throughout the whole experimental period. However, mean body weight of the control males was significantlry higher than that of males in group 3 from 10-to 18-weeks old, thereafter, they grew and gained similarly till 24-weeks old (Table 4).

On the basis of the previous findings, it could be suggested that the iodine requirements of the growing male chicks were not constant throughout the growth period. The requirements appeared to increase at the later stages of growth (20-24 weeks). Therefore, it may be detected that elevating the iodine content of the ration up 679 ppb resulted in stimulating the growth of male chicks at 24-weeks old. The iodine supplementation at the mentioned level, seemed to increase the activity of thyroid gland at certain ages (20-24 weeks), which in turn improved the weight gain of chickens. It is likely probable that the thyroid size negatively correlated with its activity, since its weight at the level of 679 ppb was less than that at 279 ppb ($p < 0.05$) These findings are in harmony with those of Hixon and Rosner (1957) and Singh *et al* (1968), who reported lighter thyroid weights for the idoine supplied chicks as compared with their controls. Moreover, it seemed reasonable to assume that the high level of iodine (1979 ppb) deleteriously affected growth in certain intervals, since the mean body weight of group 3 was significantly lower than that of group 1 (from 10 to 18 weeks of age) and than that of group 2 (from10 to 24 weeks of age). These results indicated that the level of 679 ppb iodine was more proper for growth of malers than both 279 and 1079 ppb levels. Our findings are in prartially agreement with those of Muller *et al.* (1961) and Singh *et al.* (1968) who reported marked decreases in growth rate in chicks which were hyper-orhypo thyroidism.

The means of live body weight, gain and thyroid weight of females in the different groups of Trial 1, did not significantly differ from each others at 24 weeks of age (Tables 1,3 and 4). However, the live body weight of females

in group 1 was significantly heavier than that of group 3 from10 to 20 weeks of age. Similar differences were also observed between the mean live body weight of groups 2 and 3 from 12 to 20 weeks of age. These findings support the previously mentioned assumption that the high level of iodine (1079 ppb) impaired the growth of chicks at certain stages. Therefore, the iodine level of 279 ppb appeared to be sufficient for growth of Dokki-4 pullets till 24 weeks age. Ferbes (1932), Holmes *et al.* (1935) and Grodfrey (1953) were unable to increase growth rate by iodine supplementations of Holomes *et al.* (1935) and Grodfrey (1953) were unable to increse growth rate by iodine supplementations of the chick diet. Contrary results were also obtained by Creek *et al.* (1957) and Hixon and Rosner (1957).

Concerning Trial 2, the males fed rations containing 679 ppb iodine grew at nearly similar rates as those fed a ration containing only 279 ppb iodine. The iodine additives did not significantly affect the live body weight, gain or thyroid weight of the subnormally—grown males at 24 weeks of age (Tables 2,3 and 5) . However, the average body weight of control males (group A) was significantly higher than that of group B at 10, 12 and 14 weeks of age. It can be noticed from the same tables that live body weight and gain of females in group B at 24 weeks were significantly improved when compared with their controls. The mean weight of thyroid gland of females (per chick and per 100 g body weight) at the same age was higher in group B than in group A. Moreover, irregular influnce of iodine level in the diet on thyroidweight, was found at 16 and 20 weeks of age. It is noteworthy to report that the beneficial effect of iodine supplements on retarded growth of females (group B) was not obvious till 20- week of age. A longer period of observation through more than 24 weeks of age seemed desirable to be assure that the iodine additives stimulate the retarded growth of female chicks. Further studies would be suggested to be carriecd out on this point of research.

Consequently, we may come to the following conclusions :

1—Elevating the iodine level in the ration of normally-growing chicks to guarantee 679 ppb promote the growth of males but not of females at 24-weeks of age.

2—The level of 279 ppb iodine was adequate for growth of Dokki-4 pullets till 24-weeks old.

3— Iodine supplementation to the ration of normaly-growing chicks to provide a level of 1079 ppb iodine adversely affected growth of both male and female chicks at cretain periods of growth.

4— Increasing the iodine content of the ration fed to subnormally-growing chicks to reach a level of 679 ppb resulted in improving the retarded growth of females but not of males at the age of 24 weeks.

TABLE 1.Average live body weight and gain in Trial 1 (g)

Age in weeks	Group 1 (279 ppb I_2)		Group 2 (679 ppb I_2)		Group 3 (1079 ppb I_2)	
	Males	Females	Males	Females	Males	Females
8	341± 9 (34)*	309± 6 (48)	352± 8 (42)	315± 8 (34)	329± 7 (52)	300± 6 (49)
10	505±11 (34)	443± 7 (48)	524±11 (42)	457±10 (34)	471±10 (52)	421± 9 (49)
12	750±16 (34)	637±11 (48)	689±15 (42)	596±15 (34)	654±14 (52)	562±10 (49)
14	938±22 (34)	755±14 (48)	896±20 (42)	751±18 (34)	746±16 (52)	631±12 (49)
16	1046±25 (34)	842±14 (48)	1075±23 (42)	880±19 (34)	929±17 (52)	776±13 (49)
18	1280±25 (32)	985±17 (46)	1278±26 (40)	1009±20 (32)	1099±19 (50)	871±16 (47)
20	1398±27 (32)	1070±17 (46)	1466±32 (40)	1105±23 (32)	1322±22 (50)	1010±17 (47)
22	1433±24 (29)	1065±30 (43)	1533±31 (37)	1110±35 (26)	1462±23 (34)	1053±19 (36)
24	1521±23 (29)	1137±34 (43)	1609±34 (37)	1125±41 (22)	1503±28 (34)	1085±25 (35)
Gain (at 24 weeks) . .	1178±26 (29)	834±30 (43)	1257±23 (37)	815±48 (22)	1173±28 (34)	779±25 (35)

* Number of chicks per group

TABLE 2. Average live body weight and gain in Trial 2 (g)

weeks	Group A (279 ppb I_2)		Group B (679 ppb I_2)	
	Males	Females	Males	Females
8	222±13 (13)*	199± 6 (26)	202± 4 (20)	196± 4 (22)
10	356±23 (13)	283± 9 (26)	310± 9 (20)	299± 6 (22)
12	564±26 (13)	453±15 (26)	509±12 (20)	469±12 (22)
14	753±23 (13)	625±20 (26)	682±17 (20)	625±12 (22)
16	947±28 (13)	772±23 (26)	874±23 (20)	794±13 (22)
18	1133±28 (11)	915±27 (24)	1112±24 (18)	946±21 (17)
20	1250±31 (11)	1037±29 (24)	1292±27 (18)	1128±21 (17)
22	1408±45 (8)	1159±40 (17)	1399±36 (14)	1250±31 (17)
24	1508±48 (8)	1238±40 (17)	1511±39 (14)	1345±53 (17)
Gain (at 24 week) . .	1296±49 (8)	1039±39 (17)	1311±38 (14)	1149±34 (17)

* Number of chicks per group.

TABLE 3. Average thyroid weight in Trials 1 and 2

Age (in weeks)	Group	Thyroid weight (mg)			
		Males		Females	
		Per chick	Per 100 body weight	Per chick	Per 100 body weight
		Trial 1			
16	1	111.4	10.3	70.3	8.7
	2	104.1	8.3	67.3	7.8
	3	72.7	6.7	68.1	8.9
20	1	116.6	7.8	76.3	7.7
	2	87.3	5.5	123.8	9.7
	3	108.0	7.3	99.3	8.9
24	1	112.1	7.9	108.5	9.0
	2	84.7	5.5	105.3	8.7
	3	105.9	6.8	84.5	7.7
		Trial 2			
16	A	107.0	9.7	62.0	7.6
	B	72.2	7.8	62.3	7.7
20	A	134.5	10.4	128.8	12.1
	B	131.4	9.9	139.8	12.1
24	A	119.5	8.4	67.9	6.2
	B	97.1	6.7	109.3	7.7

TABLE 4. Comparisons of means of different groups in Trial 1

Character	"t" values					
	Males			Females		
	$\bar{X}_1-\bar{X}_2$	$\bar{X}_1-\bar{X}_3$	$\bar{X}_2-\bar{X}_3$	$\bar{X}_1-\bar{X}_2$	$\bar{X}_1-\bar{X}_3$	$\bar{X}_2-\bar{X}_3$
Body weight at 8 weeks old	0.948	1.077	1.969	0.584	1.060	1.433
Body weight at 10 weeks old	1.257	2.349*	3.718*	1.119	1.889	2.676*
Body weight at 12 weeks old	2.098*	4.494*	1.678	2.222*	5.132*	2.244*
Body weight at 14 weeks old	1.423	7.171*	5.881*	0.188	6.853*	5.722*
Body weight at 16 weeks old	0.852	3.940*	5.108*	1.590	3.418*	4.529*
Body weight at 18 weeks old	0.050	5.806*	5.647*	0.897	5.297*	5.659*
Body weight at 20 weeks old	1.631	1.932	3.479*	1.207	2.464*	3.301*
Body weight at 22 weeks old	2.539*	0.863	1.849	0.985	0.338	1.454
Body weight at 24 weeks old	2.146*	0.495	2.415*	0.245	1.269	0.842
Weight gain at 24 weeks	2.296*	0.151	2.370*	0.115	1.378	0.072
Thyroid weight at 24 weeks	3.630*	0.665	5.888*	0.260	1.791	1.368

* $P > 0.05$

TABLE 5. Comparison of means of different groups in Trial 2

	"t" values	
	Males ($\bar{X}_A-\bar{X}_B$)	Females($\bar{X}_A-\bar{X}_B$)
Body weight at 8 weeks old	1.671	0.597
Body weight at 10 weeks old	2.179*	1.408
Body weight at 12 weeks old	2.133*	0.800
Body weight at 14 weeks old	2.524*	0.004
Body weight at 16 weeks old	1.893	0.774
Body weight at 18 weeks old	0.549	0.874
Body weight at 20 weeks old	1.055	2.468*
Body weight at 22 weeks old	0.139	1.818
Body weight at 24 weeks old	0.049	2.154*
Weight gain at 24 weeks	0.248	2.090*
Thyroid weight at 24 weeks	1.597	2.770*

* $P > 0.05$

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النمو فى ذكور واناث كتاكيت دقى ـ ٤ ومدى تأثره باضافة اليـــود

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شملت التجربة ٤٥٠ كتكوت دقى ـ ٤ عمر يوم ، غذيت على عليقة أساسية حتى عمر ثمانية أسابيع . وعند هذا العمر تم تقسيمهم الى قســمين : كتاكيت عادية النمو وأخرى متأخرة النمو وبدأت بعد ذلك عليهم معاملتين غذائيتين . وزعت كتــاكيت القســم الأول (المعــاملة الأولى) فى ثــلاث مجموعات أعطى كل منها فى غذائه أحد المستويات التالية من اليود :

٢٧٩ أو ٦٧٩ او ١٠٧٩ جزء فى البليون على التوالى . ووزعت أفرادالقسم الثانى (المعــاملية الثانية) فى مجموعتين أعطيت المجموعة الأولى منهــا مستوى من اليود قدره ٢٧٩ جزء فى البليون بينما أعطيت الثانية مستوى قدره ٦٧٩ جزء فى البليون .

ولقد اتضح من النتائج أن رفع مستوى اليود الى ٦٧٩ جزء فى البليون قد حسن من نمو الذكور فى المعاملة الاولى حتى عمر ٢٤ أسبوع . بينما كان مستوى ٢٧٩ جزء فى البليون أكثر ملاءمة لنمو اناث نفس العمر . كذلك اتضح أن مستوى ١٠٧٩ جزء فى البليون ذو تأثير ضار على نمو كل من الذكور والاناث عند مرحلة معينة من النمو . هذا وقد أدت زيادة محتوى العليقة من اليود الى مستوى ٦٧٩ جزء فى البليون الى تحســن نمــو اناث المعاملة الثانية الخاصة بالأفراد المتأخرة النمو . وذلك عند عمر ٢٤ أسبوع ، وان لم يظهر تأثير ممائل للاضافة على نمو الذكور .