Egypt. J. Anim. Prod., Vol. 26, No. 2 pp 137 - 147 (1986)

Influence of Dietary fat on production Traits, Alimentary Canal and Giblets of Hubbard Broilers at Eight weeks of Age

G.A.R, Kamar, M.A.M. Kicka, S.A. Riad, S.M.T. El-Tantawy and A.A. Desouky
Animal Production Department, Faculty of Agriculture, Cairo University

A TOTAL of 600 Hubbard broilers were used to study the effect of dietary tallow, soybean oil and cottonseed oil at the levels of 8%, 6% and 3% on production traits, alimentary canal and giblets at eight weeks of age. Values of body weight, growth rate, feed efficiency and monetary return were improved in broilers fed 8% dietary tallow compareed to those fed 8% soybean oil; their lowest values were found by adding 3% cottonseed oil in the diet and in the control one.

The least amount of feed consumed was obtained with diets containing tallow, while chicks consumed were feed when cottonseed oil was added to their diets. Mortality rates were not affected by use of supplemental fat in the diet.

Using any type of fat in diets caused significant increases in the relative weights of heart and liver, the absolute weight and length of alimentary canal. These increases were greater by adding tallow than by using soybean oil or cottonseed oil.

The relative gizzard weight was significantly lower in birds fed supplemented fat diets; however, the reduction was greater when using tallow as compared to soybean oil and cottonseed oil.

Key words : Broiler, Dietary fat, Feed consumption, Alimentary canal, Giblets, Mmonetary return.

Supplemental fat in the diet of growing chicks has deleterious effect in some cases and beneficial effects in others. Soybean oil was found to be determental to chick growth when added at levels higher than 10% (Henderson and Irwin, 1940). The growth rate of chicks was markedly depressed as the level of dietary cottonseed oil was raised from 10 to 15% (Yacowitz, 1953). By contrast. consistent improvement of chick growth and utilization was demonstrated when diets containing either soybean oil at levels of 1 and 2% (Pepper *et al.*, 1953), 2.5. and 5% (Yacowitz, 1953), 4.5% (Vanschoubroek *et al.*, 1971), 6% (Bartov *et al.*,

1974) or cottonseed oil at levels 2.5 and 5% (Yacowitz, 1953) were used.

The stimulation of weight again was found to be higher using soybean oil comparell to adding tallow (Vermeersch and Vanschoubroek, 1968), or supplementing tallow than with cottonseed oil (March and Biely, 1954) in the basal diet. The efficiency of feed utilization was improved by about 5.3, 6.4,9.9 and 13% with diets containing 2.5% soybean oil (Yacowitz and Chambrelin, 1954 or 4, 8, and 12% tallow (Malik *et al.*, 1966), respectively, The feed consumption decreased progressively with the increasing level of fat in the diet (Vermeersch and Vanschoubroek, 1968). Mortality rate was not affected with increased the levels of added fat from 3 through 9% (Atteh *et al.*, 1983).

Changes in broiler production traits as a result of adding fat to the basal diet has been attributed to some variations in broiler body systems. A progressive increase in the percentage of intestinal, heart and liver weight with increasing the level of tallow from 0 to 2, 4, 6 and 8% in the diet has been reported. However, a reduction was found in the percentage of gizzard with and without fat by adding the same levels of tallow in the diat (Essary and Dawson, 1965).

The present work was done to study the effect of the dietary tallow, soybean oil and cottonseed oil at the levels of 8%, 6% and 3% on production traits, alimentary canal and giblet weights of Hubbard broilers at eight weeks of age.

Material and Methods

The experimental work was carried out at the Poultry Research Center, Animal Production Department. Faculty of Agriculture, Cairo University during November and December, 1984. A total of 600 day-old Hubbard chicks awere used to study the effect of adding different sources and levels of fat to the diet on production traits, alimentary canal and giblet weight. During the first two weeks of age, all chicks were reared on the floor and fed **ad libitum** on a starting diet containing 23.5% crude protein and 3200 kcal M.E./kg diet.

At two weeks of age, the chicks awere divided randomly into four equal groups alloted to the added type of fat in the grower

diets as follows (1) Tallow, (2) Soybean oil, (3) Cottonseed oil and (4) without fat used as the control. Each of the three dietary fat groups was divided to three sub-groups according to the level of fat as follows : (a) 8%, (b) 6% and (c) 3%. The ten grower diets contained 21% crude protein and 3200 kcal M. E/Kg diet with a constant calorie/protein ratio of 152. Two replicates assigned were to each grower diet. Feed and water were provided **ad libitum.** Individual body weights were recorded at eight weeks of age. Growth rate, feed consumption, feed efficiency and mortality rate were calculated for the priod from two through eight weeks of age.

At eight weeks of age, ten birds from each dietary treatment (five from each sex) were randomly chosen, weighed, slaugtered and eviscerated. The total length of the alimentary canal from onset of the esophagus to the distal end of the rectum was measured in centimeters, The total weight of the alimentary canal was recorded, The heart, gizzard and liver were removed, weighed and their proportion to live body weight were calculated. .

From day old to eight weeks of age, monetary return/kg live body weight was calculated as value of poultry meat soled less costs for feed and day-old ckicks. Poultry meat was sold for 1.3 LE (Egyptian pounds) / kg live weight. The price of the day-old chick was 0.34 LE. The starter diet cost was 253 LE / ton. Grower diets costs for the rations supplemented with 8%, 6% and 3% tallow, 8%, 6%, and 3% soybean oil, 8%, 6%, and 3% soybean oil, 8%, 6%, and 3% cottonseed oil and without fat were 252, 251, 239, 242, 243, 242, 243, 248 and 226 LE/ton; respectively.

The data obtained were analysed statistically according to the methods of (Snedecor and cochran 1968) and (Duncan 1955).

Results and Discussion

A. Production traits

Effect of fat type Production traites of broilers fed different types of dietary tallow, soybean oil and cottonseed oil are shown in Table (1). The presented values indicat that feeding broilers with diets containing any type of fat resulted significantly heavier body weights, faster growth rates and better feed efficiency than

TABLE 1 : Different dietary fat types affecting production traits of Hubbard broilers.

Charcter	Tallow	Soybean oil	Cottonseed oil	Control
Body weight (gm)	1570.2a	1554.3ab	1499.9bc	1415.9c
	±31.9	±35.8	±37.8	±40.9
Growth rate	152.1a	151.5ab	150.5ab	148.5b
	± 1.7	± 1.5	± 1.7	± 2.0
Feed consumption	71.12a	72.96ab	76.07b	70.25a
(gm/bird/day)	± 1.11	± 0.90	± 2.00	± 1.46
Feed efficiency	2.07a	2.12ab	2.33bc	2.48c
(feed/gain)	± 0.02	± 0.03	± 0.01	± 0.01
Mortality rate	2.22a	2.22a	1.67a	5.00a
(%)	± 1.03	± 1.03	± 0.56	± 0.98
Monetary return/kg	0.59a	0.57a	0.53b	0.52b
(LE)	± 0.74	± 0.87	± 0.82	± 0.88

Means within the same row followed by a different letter are significantly differ from each other ($P < 0.05$).

those fed with the basal diet. The result indicates that adding any type of fat to broiler diets improves their productive traits. Similar results were observed (Yacowitz 1953), (Yacowitz and Chamberlin 1954) and Waibel (1955).

Supplementing the diet with soybean oil did not significantly improve body weight, growth rate and feed efficiency over that of the cottonseed oil, while the greatest improvement of these traits was observed with adding tallow to the diet. It appears that improvement of production traits was greater with animal fat than with plant oil supplementation to the diet. Similar result was obtained by March Beily (1954) and Porter and Pritton (1974). Denton *et al.*, (1954) and Arscott *et al.*, (1956) stated that animal fat contained an unidentified growh factor.

Data in Table (1) showed also that broilers fed diets containing cotton-seed oil consumed significantly larger amounts of the daily feed intake than tallow, soybean oil and control diet. This result disagree with that reported by (Vermeersch and Vansoubroek 1968), whi found that adding animal fat or plantoil diminished the feed intake.

The feed consumption of chicks fed tallow or soybean oil were not significantly different, while a larger amount of feed was consumed by chicks fed cottonseed oil. These results disagree with (Vermeer and Vanschoubroek 1968) who stated that the addition of soybean oil and tallow to diet decreased the feed intake than other fat types.

Mortality rates were not significantly affected by different supplemental fat types in the diet. Similar results were observed by (Atteh *et al.*, 1983) with dietary animal fat and by (Vanschou broek *et al.*, 1971) with dietary soybean oil.

Concerning the monetary return, the soybean oil supplemented diet produced a significantly higher value than those of dietary cottonseed oil or control diet, while the best monetary return was obtained by adding tallow to the diet. The increased monetary return for broillers fed dietary tallow could be attributed to their final weights and their lowest feed consumption.

Effect of Fat Level The influence of dietary fat levels on production traits is show in Table (2). Within all dietary fat types, results indicated that the body weight, growth rate and feed.

Efficiency progressively improved as the dietary fat level increased gradually from 0 to 3, 6 and 8%. It appears that the stimulation for improving production traits was positively related with increasing the adding level of fat in the diet. Similar result were obtained in a comparison between the two levels 2.5 and 5% by Summers *et al.*, (1965) with the dietary tallow and by Yacowitz (1953) with the dietary soybean oil and cottonseed oil.

The stimulation found by improving body weight and feed utilization with increasing the dietary fat levels were of higher magnitude in the present study than those reported by potter *et al.*, (1960). They found that the addition of 1% fat to the basal diet resulted an increase of 7.71 gm in body weight and an increase of 0.0052 in feed utilization for broilers at eight weeks of age. Values of body weight, growth rate and feed efficiency were more improved in broilers fed dietary 8% tallow than in those fed 8% soybean oil, while lowest values were found by adding 3% cottonseed oil and in the control.

TABLE 2 : Different dietary fat levels affecting production traits of Hubbare broilers.

Fat type	8%	6%	3%	Control
	Body weight (gm)			
Tallow	1647.9a ±30.7	1549.3ab ±29.9	1540.4b ±35.2	1415.9c ±40.9
Soybean oil	1624.1a ±39.6	1535.4ab ±29.1	1503.3bc ±38.6	1415.9c ±40.9
Cottonseed oil	1523.3a ±38.0	1508.4a ±37.6	1467.9b ±37.7	1415.9c ±40.9
	Growth rate			
Tallow	154.2a ± 1.6	151.2ab ± 1.3	150.9ab ± 2.1	148.5b ..... ± 2.0
Soybean oil	154.0a ± 1.6	150.8ab ± 1.5	149.7b ± 1.5	148.5b ± 2.0
Cottonseed oil	152.8a ± 1.7	149.3ab ± 1.7	149.5ab ± 1.6	148.5b ± 2.0
	Feed consumption (gm/bird/day)			
Tallow	71.80a ± 0.34	68.97a ± 0.82	72.58a ± 2.19	70.25a ± 1.46
Soybean oil	73.76a ± 0.47	71.69a ± 1.13	73.42a ± 1.11	70.25a ± 1.46
Cottonseed oil	79.50b ± 0.32	75.90ab ± 3.89	72.80ab ± 1.79	70.25a ± 1.46
	Feed efficiency (feed/gain)			
Tallow	1.99a ± 0.03	2.07a ± 0.02	2.15a ± 0.02	2.48b ± 0.01
Soybean oil	2.06a ± 0.02	2.16a ± 0.03	2.15a ± 0.03	2.48b ± 0.01
Cottonseed oil	2.28a ± 0.02	2.26a ± 0.01	2.46b ± 0.01	2.48b ± 0.01
	Mortality rate (%)			
Tallow	1.67a ± 0.56	1.67a ± 0.56	3.33a ± 1.96	5.00a ± 0.98
Soybean oil	1.67a ± 0.56	1.67a ± 0.56	3.33a ± 1.96	5.00a ± 0.98
Cottonseed oil	1.67a ± 0.56	1.67a ± 0.56	1.67a ± 0.56	5.00a ± 5.98
	Monetary return/kg (LE)			
Tallow	0.61a ± 0.58	0.59a ± 0.75	0.58a ± 0.90	0.52c ± 0.88
Soybean oil	0.60a ± 0.42	0.57ab ± 0.98	0.54bc ± 1.21	0.52c ± 0.88
Cottonseed oil	0.55a ± 0.90	0.53a ± 0.81	0.52a ± 0.75	0.52a ± 0.88

Means within row within classification followed by a different letter are significantly differ from each other ($P \leqslant 0.05$).

It can be also observed in Table (2) that increasing the levels of dietary tallow or dietary soybean oil did not significantly change feed consumption; however, daily feed intake per bird was significantly increased by increasing the cottonseed oil percentage in the diet. Both results disagree with that reported by (Vermeersch and Vanschoubroek 1968), who stated that the feed intake decreased significantly as the level of the dietary fat increased.

Mortality rate was not significantly affected by the level of dietary fat. Similar reslts were obtained by (El-Helaly 1983) with dietary 0, 2.5, 5 and 7.5% tallow and soyqbean oil and by Atteh *et al.*, (1983) with 0, 3, 6 and 9% animal fat added in the diet.

A progressive improvement in monetary return value was obtained as the level of dietary tallow or dietary soybean oil increased from 3, 6 and 8%, while its lowest value awas produced with the control diet; however, there were no significant differences in monetary return values between the four levels of dietary cottonseed oils.

The best monetary return value was resulted with 8% tallow, followed by 8% soybean oil; the lowest value was produced by adding 3% cottonseed oil in the diet and in the control.

B. Alimentary canal and giblets

Effect of fat type the mean values of alimentary canal, heart, gizzard and liver weights as affected by different dietary fat types are presented in Table (3). Results showed that the total alimentary canal length was not significantly greater in birds receiving diets supplemented with any of the types of fat in this experement compared of those fed the basal diet.

Data in Table (3) showed also that using any type of the types of fat caused a significant increase in the relative weights of heart and liver and the absolute weight of alimentary canal. The increases in these weights were greater when tallow was added than when soybean oil or cottonseed oil in the basal diet were used.

The relative gizzard weight was significantly lower in birds fed supplemented fat diets than in those fed the control diet. This

TABLE 3 : Different dietary fat types affecting alimentary canal (Length and weight) and giblets of Hubbard broilers.

Character	Tallow	Soybean oil	Cottonseed oil	Control
Alimentary canal	188.0a	187.5a	188.0a	180.0a
Length (cm)	±4.3	±2.8	±5.3	±6.8
Alimentary canal	79.7a	78.3ab	75.9ab	68.4a
Weight (gm)	±3.4	±3.2	±4.4	±3.6
Heart (%)	0.65a	0.61ab	0.63ab	0.55b
	±0.03	±0.03	±0.02	±0.04
Gizzard (%)	1.69b	1.76ab	1.88ab	2.04a
	±0.12	±0.05	±0.09	±0.14
Liver (%)	2.22a	2.15ab	2.18ab	1.92b
	±0.06	±0.07	±0.07	±0.07

Means within the same row followed by a different letter are significantly differ from each other ($P < 0.05$).

reduction in relative gizzard weight was greater by using tallow than soybean oil and cottonseed oil in the basal diet.

Effect of fat level the influences dietary fat levels on the alimentary canal, heart, gizzared and liver weights are shown in Table (4). Within all supplemented dietary fat types, results indicated that the total alimenary canal length, absolute alimentary canal weight, relative heart weight and relative liver weight were progressively increased as the level of dietary fat gradually increased. On the other hand, the relative gizzard weight decreased significantly with increasing added fat level in the diet. Results for relative heart, liver and gizzard weights are in agreement with those reported by (Essary and Dawson 1965), in when 2, 4, 6, and 8% tallow were added to the diet.

It can be concluded that supplemented fat in the broiler ration caused increases in both total alimentary canal length and relative liver weight. Increasing the relative liver weight means also greater bile secretion which aids by its emulsifying action on the absorption of fats. When feed passes through the longer alimentary canal, more feed will be digested and consequently absorbed. This condition causes more feed consumption and better

TABLE 4 : Different dietary fat levels affecting alimentary canal (Length and weight) and giblets of Hubbard broilers.

Fat Type	8%	6%	3%	Control
	Alimentary canal length (cm)			
Tallow	195.9a	186.9ab	181.2ab	180.0b
	±3.1	±4.4	±5.5	±6.8
Soybean oil	197.9a	184.5ab	180.2b a	180.0b
	±4.1	±1.0	±3.5	±6.8
Cottonseed oil	191.7a	189.0a	183.3b a	180.0a
	±4.9	±3.9	±7.4	±6.8
	Alimentary canal weight (gm)			
Tallow	87.1a	76.7ab	75.3bc	68.4c
	±3.5	±3.0	±3.7	±3.6
Soybean oil	84.2a	77.0ab	73.6ab	68.4b
	±3.4	±2.5	±3.8	±3.6
Cottonseed oil	78.3a	74.2a	75.3a b	68.4a
	±6.5	±3.5	±3.2	±3.6
	Heart (%)			
Tallow	0.67a	0.63ab	0.64ab	0.55b
	±0.02	±0.03	±0.03	±0.04
Soybean oil	0.67a	0.62ab	0.54ab	0.55b
	±0.03	±0.03	±0.03	±0.04
Cottonseed oil	0.66a	0.60ab	0.62ab	0.55b
	±0.02	±0.02	±0.03	±0.04
	Gizzard (%)			
Tallow	1.63b	1.69ab	1.76ab	2.04a
	±0.09	±0.13	±0.12	±0.14
Soybean oil	1.64b	1.69ab	1.91ab	2.04a
	±0.02	±0.06	±0.08	±0.14
Cottonseed oil	1.62a	2.04a	2.00a	2.04a
	±0.09	±0.09	±0.09	±0.14
	Liver (%)			
Tallow	2.30a	2.19a	2.18a	1.92b
	±0.06	±0.06	±0.06	±0.07
Soybean oil	2.24a	2.13ab	2.09ab	1.92b
	±0.06	±0.07	±0.08	±0.07
Cottonseed oil	2.21a	2.15ab	2.19ab	1.92b
	±0.05	±0.05	±0.13	±0.07

Means within row within classification followed by a different letter are significantly differ from each other ($P \leq 0.05$).

feed efficiency. So, birds receiving supplemental fat in their diets show faster growth rate and heavir final body weights; however these bird had greater amount of deposited fat especially when tallow added to the diet.

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تأثير اضافةدهون لعلائق كتاكيت الهبرد على صفات الانتاج والقناة الهضمية والحوائج عند عمر ٨ أسابيع .

جمال قمر — مختار عبد الفتاح — سوزان رياض — شكرى المنطاوى — عادل الدسوقى
كلية الزراعة — جامعة القاهرة

استخدم فى هذا البحث كتاكيت هبرد مقدم لها خلال الفترة من (٢ — ٨) أسابيع علائق نمو تختلف فى مصادر الدهن (دهن حيوانى — زيت فول الصويا — زيت بذرة القطن) ومستوياته (٣٪ — ٦٪ — ٨٪) مع المقارنة بمجموعة مقدم لها العليقة الأساسية فقط وكانت النتائج كما يلى :

لوحظ تفوق الطيور المقدم لها ٨٪ دهن حيوانى بالعليقة عن تلك المضاف لعليقتها ٨٪ زيت فول الصويا فى كل من صفات وزن الجسم ومعدل النمو والكفاءة الغذائية والعائد الاقتصادى ، بينما انخفضت هذه الصفات عند استعمال ٣٪ زيت بذرة القطن بالعليقة وعند استعمال العليقة الأساسية فقط .

اضافة الدهن الحيوانى الى العليقة أدى الى خفض استهلاك العلف ، بينما اضافة زيت بذرة القطن أدى الى زيادة استهلاك العلف .
معدل التفوق لم يتأثر بأختلاف مصادر مستويات الدهن فى العليقة .

اضافة أى نسبة من الدهن الى العليقة أدى الى زيادة الوزن النسبى لكل من القلب والكبد وزيادة الطول والوزن المطلق للقناة الهضمية فى حين ادت الى انخفاض الوزن النسبى للقونصة وجميع هذه التغيرات زادت باستعمال العلائق المحتوية على دهن حيوانى عن الاخرى المحتوية على زيوت نباتية .