

Different Dietary fat Types Affecting Carcass Characteristics and Composition of Hubbard Broilers at eight weeks of age.

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A TOTAL of 600 Hubbard broilers were used to study the effect of dietary tallow, soybean oil and cottonseed oil at levels of 8%, 6% and 3% on carcass characteristics and composition at eight weeks of age. Adding any level of dietary tallow improved both dressing and hind-part percentages. Diets containing 8% tallow are accompanied by the greatest quantity of abdominal fat deposition. Broilers fed any level of plant oil resulted carcasses that had high dressing and front-part percentages and low abdominal fat percentage.

Adding fat to the broiler diet caused a decrease of the water percentage and an increase of the fat percentage in the carcass. Both moisture and fat contents in the carcass were more affected by using animal fat than by adding plant oil in the diet. The fat percentage in the carcass was significantly higher by adding 8% fat than by using 6% or 3% fat in the diet. The moisture and protein contents were higher in breast than in thigh while the fat and ash contents had the opposite trend. Neither carcass protein nor ash percentages were affected by varying the level and type of fat in the diet.

Key words : Broiler, Dietary fat, Carcass characteristics, Carcass Composition.

Fats from several sources are widely used in the broiler diets to improve their production traits. Most investigations on fat for broilers deal with body weight but in few cases are carcass weight and composition considered.

Adding fat to the diet increased the dressing percentage (Marion and Woodroof, 1966). Use of dietary fat was accompanied by increased abdominal fat deposition (Bartov and Bornstein, 1976). The abdominal fat deposition rose as the dietary tallow increased gradually from 0 through 8% (Essary et al., 1965). The amount of the abdominal fat was greater using tallow than by adding soybean oil in the basal diet (Pan et al., 1979).

The composition of the chick a carcass was affected by type and level of dietary fat (Rand *et al.*, 1957). The addition of 5 and 10% tallow led to increased carcass fat content (Waibel, 1955). The percentage of carcass fat rose from 23.8% to 25% as the dietary tallow level increased from 2.5% to 5% (Summers *et al.*, 1965 and sabbah *et al.*, 1982). The amount of fat in the carcass was greater with using animal fat than with adding plant oil in the basal diet (Mickelberry *et al.*, 1966).

In the carcass, the fat content was inversely correlated with the moisture content (Velu *et al.*, 1972). Both moisture reduction and fat increase in the carcass were greater with using animal fat than with adding plant oil in the basal diet (Mickelberry *et al.*, 1966 and Marion and Woodroof, 1966). The moisture percentage was higher in the breast meat than in the thigh meat, while the fat percentage had an opposite trend (Mickelberry *et al.*, 1966); however, both carcass protein (Twining *et al.*, 1978) and carcass ash contents (El-Helaly, 1983) were not affected greatly by adding fat in the diet.

This work aimed to study the specific effect of the dietary tallow, soybean oil and cottonseed oil at the level of 8%, 6% and 3% on carcass characteristics and composition of Hubbard broilers at eight week 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 were used to study the effect of adding different types and levels of fat to the diet on carcass characteristics and composition. For the first two weeks of age, all chicks were kept on 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, chicks were divided randomly into four equal groups allotted 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 control. Each from the first 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 constant calorie/protein ratio of 152. Two replicates were assigned to each grower diet. Feed and water were provided *ad libitum*.

Ten birds from each treatment (five from each sex) were taken randomly at eight weeks of age to determine the carcass characteristics and composition. Birds were weighed, slaughtered, dryplucked and eviscerated. Head and shanks were removed. The carcass was cut to front and hind parts. The abdominal fat (pad, gizzard and visceral fats) was removed. The weights of carcass, frontpart, hind-part and abdominal fat were recorded and were proportionated to the live body weight.

Six carcasses (three from each sex) were chosen randomly to determine the moisture, protein, fat and ash contents. The skin, meat and bone from each of the front-part (breast) or hind-part (thigh) were mixed together. Representative samples from breast and thigh were taken and analysed according to the methods of the A.O.A.C., (1975).

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

Results and Discussion

A Carcass characteristics

Effect of fat type the mean values of carcass characteristics as affected by different dietary fat types supplemented are presented in Table (1). It is clear that the broilers receiving diets containing tallow, soybean oil had higher dressing percentages than those fed the basal diet, while there were no significant differences in these percentages between the three fat types. These results indicate that adding any type of fat to the broiler diet caused an improvement in the dressing percentage. Similar result was obtained by Marion and Woodroof (1966).

Results in Table (1) show also that, the front-part, hind-part and abdominal fat percentages were not significantly affected by varying the fat sources supplemented in the diet. This result disagrees with that reported by Pan *et al.* (1979), who reported that the abdominal fat deposition was greater in birds fed dietary tallow than in those receiving dietary soybean oil.

TABLE 1 : Different dietary fat types affecting carcass characteristics of Hubbard broilers.

Character	Tallow	Soybean oil	Cottonseed oil	Control
Dressing (%)	61.1a ±0.4	60.8a ±0.4	60.5ab ±0.7	59.3b a ±0.5
Front- Part (%)	33.8a ±0.4	33.9a ±0.6	33.5a ±0.5	33.0a ±0.3
Hind-Part (%)	27.3a ±0.4	26.9a ±0.4	26.9a ±0.4	26.3a ±0.4
Abdominal fat (%)	1.5a ±0.3	1.3a ±0.2	1.3a ±0.2	1.1a ±0.2

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

Effect of fat level the influence of dietary fat level on the carcass characteristics is shown in Table (2). Results indicated that within all dietary fat types, the dressing percentages were progressively improved as the dietary fat level increased from 3 to 6 and 8%, while no significant differences in these percentages were obtained between the three different fat levels. The least values of dressing percentage was found significantly with using the control diet. This means that adding any level (3, 6, or 8%) of fat to the broiler diet caused an improvement in the dressing percentage.

Results in Table (2) showed also that broilers fed diets containing 3, 6 or 8% either soybean oil or cottonseed oil had higher front-part percentages than those received the control diet, while there were no significant differences in these percentages between the three dietary oil levels. However the hind-part and the abdominal fat percentages were not significantly affected by adding any level of either soybean oil or cottonseed oil in the diet. Thus it appears that supplementing 3, 6 or 8% of either soybean oil or cottonseed oil in the diet has beneficial effects on the broiler carcass characteristics, whereas broilers fed any of these dietary oils had high dressing and front-part percentages and low abdominal fat percentage.

TABLE 2 : Different dietary fat levels affecting carcass characteristics of Hubbard broilers.

Fat type	8%	6%	3%	Control
	Dressing (%)			
Tallow	61.5a	61.0a	60.8a	59.3b
	±0.5	±0.3	±0.5	±0.5
Soybean oil	61.1a	60.6a	60.6a	59.3b
	±0.3	±0.4	±0.5	±0.5
Cottonseed oil	61.1a	60.4ab	60.0ab	59.3b
	±0.7	±0.4	±0.5	±0.5
	Front-part (%)			
Tallow	33.8a	33.6a	34.1a	33.0a
	±0.6	±0.6	±0.8	±0.3
Soybean oil	34.3a	33.6ab	33.8ab	33.0b
	±0.4	±0.4	±0.3	±0.3
Cottonseed oil	34.4a	33.1ab	33.2b	33.0b
	±0.4	±0.5	±0.5	±0.4
	Hind-part (%)			
Tallow	27.7a	27.4ab	26.7ab	26.3b
	±0.3	±0.5	±0.5	±0.4
Soybean oil	26.8a	27.0a	26.8a	26.3a
	±0.4	±0.4	±0.4	±0.4
Cottonseed oil	26.7a	27.2a	27.0a	26.3a
	±0.4	±0.2	±0.5	±0.4
	Abdominal fat (%)			
Tallow	1.9a	1.4ab	1.1b	1.1b
	±0.2	±0.3	±0.2	±0.2
Soybean oil	1.4a	1.3a	1.3a	1.1a
	±0.1	±0.3	±0.2	±0.2
Cottonseed oil	1.3a	1.4a	1.2a	1.1a
	±0.2	±0.2	±0.2	±0.2

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

With added dietary tallow, the hind-part and the abdominal fat percentages were significantly increased, while the front-part percentages were not significantly affected in comparison with those using the control diet. The hind-part percentages were progressively improved as the dietary tallow level increased from 3

to 6 and 8% and significant differences between the three different levels.

Diets containing 8% tallow gave the significantly highest quantity of the abdominal fat deposition. However, the abdominal fat percentage did not change significantly with adding either 3% or 6% tallow in the diet compared to using the control diet. Thus it appears that adding 3% 6% and 8% tallow to broiler diet improves the dressing and hind-part percentages, while using 8% dietary tallow results the highest quantity of abdominal fat deposition.

Carcass composition

Effect of fat type the mean values of carcass composition for the experimental nutritional groups are presented in Table (3).

TABLE 3 : Different dietary fat types affecting carcass composition of Hubbard broilers.

Character	Tallow	Soybean oil	Cottonseed oil	Control
Breast				
Moisture (%)	68.8c ±0.3	69.3bc ±0.4	70.0b ±0.2	71.5a ±0.1
Protein (%)	20.5a ±0.2	20.8a ±0.2	20.4a ±0.2	20.5a ±0.4
Fat (%)	9.2a ±0.3	8.8ab ±0.2	8.4b ±0.3	7.6c ±0.2
Ash (%)	1.03a ±0.04	1.02a ±0.07	1.01a ±0.05	1.00a ±0.05
Thigh				
Moisture (%)	68.8c ±0.2	68.8bc ±0.4	59.5ab ±0.3	70.2a ±0.4
Protein (%)	18.3a ±0.2	18.7a ±0.2	18.4a ±0.2	18.6a ±0.2
Fat (%)	13.3a ±0.3	11.0b ±0.4	10.6b ±0.4	9.0c ±0.3
Ash (%)	1.07a ±0.04	1.07a ±0.04	1.02a ±0.03	1.00a ±0.03

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

It is clear that the control birds had significantly the highest moisture percentages, while those fed dietary fat types had the greater fat percentages in both breast and thigh samples. This result means that adding fat to the broiler diet caused a decrease of the water percentage and an increase of the fat percentage in the carcass. A similar result was obtained by Twining *et al.* (1978).

In both carcass parts, the least percentage of water and the greatest percentage of fat resulted by adding tallow in the diet. This result means that both moisture and fat percentages in the carcass were more affected by using animal fat than by adding plant oil to the diet. Similar results were obtained by Marion and Woodroof (1966) and Mickelberry *et al.* (1966).

On the other hand, both carcass protein and carcass ash percentages were not affected by varying dietary fat type. Similar results were obtained for carcass protein by Twining *et al.* (1978) and for carcass ash by El-Helaly (1983).

It can be also observed from Table (3) that, the moisture and proteoin contents were higher in breast than in the thigh for all dietary fat types, while the fat and ash contents had the opposite trend. Similar results were obtained for moisture content by Mickelberry *et al.*, (1966) and for protein and fat contents by El-Helaly (1983).

Effect of fat level. The effect of different dietary fat levels on carcass composition are show in Table (4 and 5). Within all dietary fat types, results indicated that as the dietary fat level increased gradually from 0 to 3, 6 and 8%, the moisture content decreased and the fat content increased significantly in both breast and thigh. This result means that adding any level of fat to the broiler diet causes a depression of the water percentage and an increase in fat percentage in the carcass. Similar results were obtained by Waibel (1955) with 5% and 10% tallow and by Summers *et al.* (1965) with 2.5% and 5% tallow added in the diet.

The previous result shows also that the carcass moisture and carcass fat contents are inversely related. A similar result was obtained by Donaldson *et al.*, (1956)

Results in Table (4 and 5) show also that the fat percentages in both breast and thigh were significantly higher when 8% fat was added than by using 6% or 3% fat in the diet, but there were no significant differences between the two levels 3% and 6%.

TABLE 4 : Different dietary fat levels affecting carcass composition of broast in Hubbard broilers.

Fa type	8%	6%	3%	Control
Moisture (%)				
Tallow	66.7c ±0.2	69.7b ±0.6	70.1b ±0.1	71.5a ±0.1
Soybean oil	68.7c ±0.4	69.1bc ±0.7	70.1b ±0.2	71.5a ±0.1
Cottonseed oil	69.1c ±0.2	70.1bc ±0.2	70.9ab ±0.2	71.5a ±0.1
Protein (%)				
Tallow	20.3a ±0.3	20.8a ±0.2	20.3a ±0.1	20.6a ±0.4
Soybean oil	20.4a ±0.2	20.9a ±0.3	21.0a ±0.2	20.6a ±0.4
Cottonseed oil	20.1a ±0.3	20.4a ±0.3	20.7a ±0.1	20.6a ±0.4
Fat (%)				
Tallow	9.7a ±0.2	9.3ab ±0.5	8.6b ±0.1	7.4c ±0.2
Soybean oil	9.6a ±0.1	8.7b ±0.5	8.1bc ±0.1	7.4c ±0.2
Cottonseed oil	8.8a ±0.2	8.4ab ±0.5	8.0bc ±0.1	7.4c ±0.2
Ash (%)				
Tallow	1.04a ±0.04	1.02a ±0.03	1.02a ±0.06	1.00a ±0.05
Soybean oil	1.01a ±0.08	1.05a ±0.05	1.00a ±0.06	1.00a ±0.05
Cottonseed oil	1.03a ±0.06	0.98a ±0.03	1.03a ±0.06	1.00a ±0.05

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

TABLE 5 : Different dietary fat levels affecting carcass composition of thigh in Hubbard broilers.

Fat type	8%	6%	3%	Control
Moisture (%)				
Tallow	66.6c ±0.2	68.8b ±0.1	69.5ab ±0.4	70.2a ±0.4
Soybean oil	68.7b ±0.4	68.6b ±0.4	68.9b ±0.6	70.2a ±0.4
Cottonseed oil	68.9b ±0.2	69.6ab ±0.2	70.0a ±0.4	70.2a ±0.4
Protein (%)				
Tallow	19.2a ±0.2	18.5a ±0.2	18.1a ±0.2	18.6a ±0.2
Soybean oil	18.6a ±0.2	18.5a ±0.2	19.0a ±0.3	18.6a ±0.2
Cottonseed oil	18.4a ±0.2	18.2a ±0.2	18.6a ±0.1	18.6a ±0.2
Fat (%)				
Tallow	14.1a ±0.2	11.7b ±0.3	11.2b ±0.4	9.0c ±0.3
Soybean oil	11.4a ±0.5	11.0ab ±0.3	10.6b ±0.5	9.0c ±0.3
Cottonseed oil	11.2a ±0.4	10.5ab ±0.3	10.1b ±0.4	9.0c ±0.3
Ash (%)				
Tallow	1.07a ±0.04	1.09a ±0.03	1.06a ±0.05	1.00a ±0.03
Soybean oil	1.07a ±0.03	1.09a ±0.04	1.05a ±0.05	1.00a ±0.03
Cottonseed oil	0.99a ±0.03	1.04a ±0.03	1.04a ±0.04	1.00a ±0.03

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

On the other hand, both carcass protein and carcass ash percentages fluctuated nonsignificantly without a trend as the dietary fat level increased. It seems that both carcass protein and carcass ash percentages were not affected by varying dietary fat level. A similar result was obtained by Twining et al., (1978) for the carcass protein content and by El-Helaly (1983) for the carcass ash content.

It can be concluded that supplemental fat in the broiler ration causes increased percentages of dressing, abdominal fat (except plant oils) and carcass fat, whereas the increase was more with using tallow than with adding soybean oil or cottonseed oil in the diet. In practice, carcasses containing excessive abdominal fat and/or carcass fat content are often less desirable for final consumers and for poultry processing plants. Therefore, it is recommended to supplement only 3% or 6% from any fat type studied.

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تأثير إضافة دهون لعلائق ككتايت الهيرد على صفات وتركيب الذبائح الناتجة منها عند عمر ٨ أسابيع .

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استخدم في هذا البحث ككتايت هيرد مقدم لها خلال الفترة من (٢ - ٨) أسابيع علائق تميز بخلاف في مصادر الدهن (دهن حيواني - زيت فول الصويا - زيت بذرة القطن) وسنوياته (٣% ، ٦% ، ٨%) مع المقارنة بمجموعة مقدم لها المليئة الأساسية نط وكانت النتائج كما يلي :

إضافة أى نسبة من الدهن الحيواني أدت الى تحسين الوزن النسبي للذبيحة والجزء الخلفى ولكن ارتفاع نسبته الى ٨% أدى الى زيادة كبيرة في ترسيب دهن البطن .

إضافة أى نسبة من الزيوت النباتية أدت الى تحسين الوزن النسبي للذبيحة والجزء الأمامى .

إضافة الدهون الى علف الكتايت أدى أيضا الى تغير التركيب الكيميائى للماء والدهن بالذبيحة بينما لم تتأثر كل من نسبة البروتين والرماد بها .

إضافة أى مصدر للدهون بعلف الكتايت أدى الى انخفاض نسبة الماء وزيادة نسبة الدهون بالذبيحة وقد زاد هذا التغير باستعمال علائق المحتوية على دهن حيوانى عن الأخرى المحتوية على زيوت نباتية ، الذبائح الناتجة من تغذية الكتايت على ٨% دهن حيوانى كانت تحتوى على أكبر نسبة من الدهن ، صدر الذبيحة يحتوى على النسبة الأعلى من الرطوبة والبروتين بينما الأمخاض تحتوى على النسبة الأكبر من الدهن والرماد .