

EFFECTS OF DIETARY FAT SUPPLEMENTATION ON BODY COMPOSITION TRAITS IN MUSCOVY DUCKS

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ABSTRACT

Two hundred Muscovy hatched ducklings were used, at 5 weeks of age, randomly divided into three groups : group (1) was fed a control diet all over the experimental period, group (2) was fed the control diet supplemented with 5 % sunflower oil from 5 to 12 weeks of age, group (3) fed as group 2 up to 8 weeks of age, then birds were fed the control diet supplemented with 7.5 % sunflower oil from 9 to 12 weeks of age. Feed and water were offered *ad libitum* during the experimental period. Live body weight of birds was individually recorded each week from hatching to the end of the experiment (12 weeks). All of the gain in body weight, feed consumption (gm / bird) and feed conversion (gm feed / gm body weight gain) were recorded. However, two males and two females from each group at 4, 8 and 12 weeks of age were taken randomly through the experimental period for determining body and carcass characteristics. Live body weights of ducks were recorded before slaughtering. The birds were plucked, eviscerated and weighted and all of : body circumference, shank length, thigh length; along with absolute and relative weights of : carcass, giblets (gizzard, heart, liver), neck, inedible parts (blood, feather, alimentary canal, head, shank), giblets abdominal fat were determined. Also, dressing %, giblets %, neck %, edible parts %, inedible parts %, and deboning % were calculated. However, the chemical analysis (moisture, fat, crude protein, ash) of breast and thigh meat; and left femur of each duck (slaughtered at 12 weeks of age) were determined. The absolute and relative weights along with absolute and relative lengths of empty digestive tract and its parts (oesophagus, proventriculus, gizzard, duodenum, jejunum and ilium, rectum, caecium) were recorded.

The data revealed that : Sunflower oil supplementation at 8 and 12 weeks of age by adding either 5.0 % or 7.5 % significantly increased live body weight, carcass weight %, dressing % abdominal fat, gizzard, carcass fat, thigh ash, body circumference, thigh length, pH of jejunum and ileum contents; and significantly decreased inedible parts %, carcass moisture, carcass protein, bone ash, bone calcium, bone phosphorus, relative wt. of duodenum, relative wt. of jejunum and ileum. While, the sunflower oil supplementation at 8 and 12 weeks of age by adding either 5.0 % or 7.5 % had no effect on giblets %, breast ash, shank length, relative lengths of proventriculus and gizzard, relative length of large intestine, pH of gizzard content; but, sunflower oil supplementation at 8 and 12 weeks of age by adding either 5.0 % or 7.5% decreased liver %, pH of oesophagus and crop contents, pH proventriculus content. However, sunflower oil supplementation at 12 weeks of age by adding 7.5 % increased significantly liver %, heart %, pH of oesophagus and crop

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contents, pH proventriculus content. Sunflower oil supplementation at 12 weeks of age by adding either 5.0 % or 7.5 % increased deboning %, gizzard %, pancreas %, liver %, pH of caecum contents, pH of rectum contents; and decreased relative wt. of oesophagus and crop, relative length of oesophagus and crop. Sunflower oil supplementation at 12 weeks of age by adding 5.0 % decreased significantly neck %. Sunflower oil supplementation at 8 weeks of age by adding 5.0 % increased neck %, heart %, relative wt. of proventriculus and gizzard, liver %, relative length of jejunum and ileum; and decreased relative weight of digestive tract, pancreas %, relative length of oesophagus and crop, pH of caecum contents, pH of rectum contents.

Generally, sunflower oil supplementation to the diets of ducks improved growth rate and digestibility, and increased final body weight, body measurements and deboning %, and also reduced feed consumption.

Keywords : Muscovy ducks, dietary fat, body composition

INTRODUCTION

The supplementation of fat (from many animal and vegetable sources) to balanced diets have often shown reduction in feed intake, increase of growth rate and a more efficient utilization of feed in chicken, turkeys and ducks (*Salmon, 1969; Allam et al., 1982; Alao and Balnave, 1984; Abd-Alla, 1988; Ahmed and Maghraby, 1994; Ahmed et al., 1995; Nitsan et al., 1997*).

The effect of oil and fat supplementation on carcass quality, carcass chemical composition, body measurements and digestive system measurements were studied in chicken and ducks (*Allam et al., 1982; Alao and Balnave, 1984; Abd El-Ghani, 1986, Desoke, 1986; Abd-Alla, 1988; Ahmed and Maghraby, 1994; and Abdel-Samee, 1998*).

Changes in dietary energy concentration modulate feed efficiency through two pathways. Firstly, as dietary energy increases, energy needs are satisfied with decreasing feed intake. Secondly, growth rate is promoted by increasing dietary energy level (reviewed by *Waldroup, 1981*), provided that no other nutrient is limiting. Because supplementation of diets with high energy sources becomes increasingly costly, the choice of the energy level in practical diets is most frequently based on economical considerations.

The present study was planned to verify the effect of sunflower oil supplementation at different ages on growth, carcass composition and quality in Muscovy ducks.

MATERIALS AND METHODS

Two hundred Muscovy newly hatched ducklings were used in this study. The brooding temperature was regulated to be kept at 32 °C for the first week, then reduced weekly by 4 °C till it reached 24 °C. After three weeks of age the ducks were reared under the natural environmental temperature. The birds were provided with continuous light (23 hr light + 1 hr

dark) from hatching to 12 weeks of age. All ducklings were fed a starting diet containing 21.13 % crude protein and 2900 Kcal ME/Kg diet froth hatching to two weeks of age. During 3 and 4 weeks of age birds were fed growing diet containing 17 % crude protein and 2901.5 Kcal ME/Kg diet. At 5 weeks of age ducklings were randomly divided into three groups (1, 2 and 3). Birds in group (1) were fed a control diet all over the experimental period. Birds in group (2) were fed the control diet supplemented with 5 % sunflower oil from 5 to 12 weeks of age. While, birds in group (3) were fed diet as group 2 up to 8 weeks of age, then birds were fed a control diet supplemented with 7.5 % sunflower oil from 9 to 12 weeks of age. Feed (Table 1) and water were offered *ad libitum* during the experimental period.

Table (1). Formulation composition of the experimental diets.

Ingredients, %	Diets		
	Group (1)	Group (2)	Group (3)
Yellow corn	65.00	61.70	60.00
Soybean meal	10.50	10.00	9.75
Wheat bran	22.09	21.03	20.54
Bone meal	1.50	1.42	1.39
Lime stone	0.25	0.23	0.23
Vit. Min. permix*	0.15	0.14	0.13
Salt	0.30	0.28	0.27
Methionine	0.21	0.20	0.19
Sunflower	--	5.00	7.50
Chemical composition of diets			
Crude protein	17.07	17.08	17.07
Ether extract	2.54	7.10	9.64

* Contained 0.35% Zn; 0.20% Mn; 0.20% Fe; 0.15% Mg; 0.03% Cu; 0.05% Co; 0.007% I; 98.5% Na Cl; 2,000,000 IU/ton of final diet vitamin A palmitate; 250,000 IU/ ton final diet vitamin D₃; and 55,000 IU/ton of final diet vitamin E.

Live body weight of birds was individually recorded each week from hatching to the end of the experiment (12 weeks). All of the gain in body weight, feed consumption (gm / bird) and feed conversion (gm feed / gm body weight gain) were recorded. However, two males and two females from each group at 4, 8 and 12 weeks of age were taken randomly through the experiments for determining carcass characteristics Ducks were fasted and water was provided before slaughtering for 12 h. Live body weight of ducks were recorded before slaughtering. The birds were plucked, eviscerated and weighed. Body circumference, shank length and thigh length were measured on the dressed bird. Inedible parts (blood, feather, alimentary canal, head and shank), giblets (gizzard, heart and liver), abdominal fat, carcass, and neck were weighed. The relative weight of some organs were calculated : *dressings* % [(carcass weight + giblets weight) / (live body weight) X 100] , *giblets* % [(gizzard weight + liver weight + heart weight) / (live body weight) X

100], *neck* % [(Neck weight / live body weight) X 100], *edible parts* % [(carcass weight + giblets weight + neck wt.) / (live body weight) X 100], *inedible parts* % [(blood weight + feather weight + head weight + shank weight + alimentary canal weight) / (live body weight) X 100], and *deboning* % [(meat weight / carcass weight) X 100]. However, the chemical analysis (moisture, fat, crude protein, ash) of breast meat and thigh meat were determined according to the A.O.A.C. (1984). In order to perform bone Ca and P and their ratio, left femur of each duck of the ducks slaughtered at 12 weeks of age was removed and cleaned of adhering flesh, dried at 100 °C for 24 hour, defatted using Soxhelt extraction apparatus and dried again prior to dry ashing at 600 °C for 2 hours (A.O.A.C., 1984). The absolute weight of empty digestive tract and its parts were recorded. The relative weights of such parts were estimated by dividing the absolute weight of each part by the absolute total weight of empty digestive tract at 4, 8 and 12 weeks of age. Also, the total length of digestive tract included the length of oesophagus, proventriculus, gizzard, duodenum (jejunum and ilium) and rectum without caeca were measured. The relative length was estimated by dividing the length of each part by the total length of digestive tract. The relative length of caeca were estimated by dividing the length of caeca by the total length of digestive tract at 4, 8 and 12 weeks of age. At the same time, pH of the contents for the crop and oesophagus, proventriculus, gizzard, duodenum, jejunum and ilium, caeca and rectum were immediately determined at 4, 8 and 12 weeks of age by using Backman pH-meter. Data were subjected to one-way classification analysis of variance (MSTAT, 1986) and the Duncan Multiple Range Test (Duncan, 1955) was applied to test the differences among means when the mean effects of treatments were significant.

RESULTS AND DISCUSSION

Results in Table (2) show that the average of live body weight, carcass weight %, dressing percentage and abdominal fat increased significantly in birds which received fat than the control group. Carcass dressing % increased significantly by about 3.4 % and 5.7 % at 8 and 12 weeks of age, respectively, than the control group by adding 5.0 % level of sunflower oil, while, dressing percentage increased significantly by about 4.6 % at 12 weeks of age by adding 7.5 % level of sunflower oil. This increase may be due to the decrease in the percentage of inedible parts by increasing sunflower oil level in the diet (Table 3).

Sunflower oil supplementation at 8 and 12 weeks of age by adding either 5.0 % or 7.5 % had no effect on giblets % (Table 2). *Ahmed and Maghraby (1994)* and *Nitsan et al. (1997)* reported similar trend. The percentage of neck increased at 8 weeks of age by adding 5.0 % level of sunflower oil, but it decreased significantly at 12 weeks of age as compared by control group. The reduction amounted 1.4 % and 0.9 % by adding 5.0 % and 7.5 % level of sunflower oil, respectively. Results revealed that the increase in live body weight was associated by the decrease in the

percentage of neck %. However, deboning percentage at 12 weeks of age increased by adding 5.0 % sunflower oil level supplementation then 7.5 % as compared to control group. This increase was 3.4 % and 2.5 % by adding 5.0 % and 7.5% level of sunflower oil, respectively. This increase may be due to fat deposition that took place in body muscles (Arram, 1984).

Table (2): Effect of sunflower oil supplementation on body composition traits of Muscovy ducks at the ages of 8 and 12 weeks.

Item	Age of 4 weeks		Age of 12 weeks			SE
	Sunflower oil addition levels					
	0.0%	5.0%	0.0%	5.0%	7.5%	
Live body wt., g	2550 ^a	2570 ^a	2849 ^a	3016 ^a	3079 ^a	409
Carcass %	61.70 ^b	65.30 ^a	61.60 ^b	67.50 ^a	65.65 ^a	0.79
Giblets %	640 ^a	644 ^a	614 ^a	599 ^a	670 ^a	.028
Dressing %	68.35 ^b	7.172 ^a	67.75 ^b	73.47 ^a	72.35 ^a	0.68
Neck %	3.78 ^b	4.15 ^b	4.99 ^a	3.56 ^b	405 ^b	0.19
Abdominal fat %	.192 ^b	2.06 ^b	1.92 ^b	.227 ^b	298 ^a	0.19
Edible parts %	73.55 ^b	75.95 ^a	72.72 ^b	77.02 ^a	7640 ^a	0.54
Inedible parts %	24.17 ^a	21.80 ^b	24.87 ^a	20.47 ^b	20.37 ^b	0.47

^{a,b,c} Means in the same row with different superscripts are significantly (P < 0.05) different.

However, reduction in the percentages of inedible parts % were 2.4 % and 4.4 at 8 and 12 weeks of age, respectively by adding 5 % level of sunflower oil while, the corresponding reduction was 4.5 % at 12 weeks of age by adding 7.5 % level of sunflower oil. Also, results indicate that blood, feather, head, shank and alimentary canal decreased as sunflower oil supplementation increased (Table 3). Gizzard increased with sunflower oil supplementation at 8 and 12 weeks of age by adding 5 % or 7.5 %. However, liver % decreased with 5 % sunflower oil supplementation at 8 and 12 weeks of age. While, liver % increased with 7.5 % sunflower oil supplementation at 12 weeks of age. Heart % increased with 5 % sunflower oil at 8 weeks of age. At 12 weeks heart % had a slight decrease by adding 5 % sunflower oil then increased by adding 7.5 % sunflower oil.

Table (3): Effect of sunflower oil supplementation on relative weights of inedible parts and giblets at the ages of 8 and 12 weeks.

Item	Age of 4 weeks		Age of 12 weeks			SE
	Sunflower oil addition levels					
	0.0%	5.0%	0.0%	5.0%	7.5%	
Blood %	5.42 ^a	5.83 ^a	5.60 ^a	5.53 ^a	5.47 ^a	0.14
Feather %	5.93 ^a	5.67 ^a	5.94 ^a	5.79 ^a	5.64 ^a	0.20
Head %	4.00 ^b	4.18 ^b	5.09 ^a	3.73 ^b	3.90 ^b	0.18
Shank %	3.24 ^b	2.62 ^c	4.68 ^a	2.60 ^c	2.47 ^c	0.19
Alimentary canal %	5.64 ^a	3.30 ^b	3.62 ^b	2.86 ^b	4.18 ^{ab}	0.58
Gizzard %	2.73 ^a	2.96 ^a	2.53 ^a	2.61 ^a	2.75 ^a	0.20
Liver %	3.11 ^a	2.79 ^{ac}	2.84 ^{ab}	2.52 ^b	3.16 ^a	0.18
Heart %	0.61 ^c	0.68 ^{bc}	0.77 ^{ab}	0.75 ^{ab}	0.80 ^a	0.04

^{a,b,c} Means in the same row with different superscripts are significantly (P < 0.05) different.

It was clear that protein content in carcass (breast and thigh) decreased by increasing sunflower oil level in the diet. However, the

differences due to fat levels were not significant (Table 4). An adverse trend was observed in fat content of carcass (Table 4). Fat content of carcass increased significantly by increasing the level of sunflower oil in the diet at 8 and 12 weeks of age. Results in Table (4) indicated that adding sunflower to the diets of duck significantly decreased carcass moisture and protein content, and increased the deposition of fat. However, ash content of breast meat was not affected by adding sunflower oil, while, ash percentage significantly increased in thigh meat (Table 4). These results are in agreement with the data obtained by *Allam et al. (1982)*, *Alao and Balnave (1984)*, *Abdel-Ghani (1986)*, *Abd-Alla (1988)* and *Ahmed and Maghraby (1994)*.

However, *Nitsan et al. (1997)* revealed that addition of soyabean oil to broiler's diets had no significant effect on the composition of the carcass dry matter.

Table (4): Effect of sunflower oil supplementation on meat chemical analysis of Muscovy ducks at the ages of 8 and 12 weeks.

Item	Age of 4 weeks		Age of 12 weeks			SE
	Sunflower oil addition levels					
	0.0%	5.0%	0.0%	5.0%	7.5%	
Breast meat:						
Moisture %	76.07 ^a	73.90 ^a b	74.43 ^a b	71.93 ^b	68.30 ^c	0.93
Protein %	19.93 ^a b	18.17 ^b	21.33 ^a	19.80 ^a b	19.30 ^a b	0.63
Ether extract%	2.81 ^c	6.49 ^b	3.00 ^c	6.64 ^b	6.64 ^b	0.55
Ash %	1.02 ^a	1.10 ^a	1.09 ^a	1.09 ^a	1.20 ^a	0.06
Thigh meat:						
Moisture %	76.27 ^a	73.83 ^b c	74.93 ^b	73.00 ^c	69.93 ^d	0.41
Protein %	18.43 ^a b	18.17 ^b	19.43 ^a	18.97 ^a b	18.23 ^b	0.33
Ether extract%	4.29 ^c	6.61 ^b	4.53 ^c	6.82 ^b	10.43 ^a	0.27
Ash %	0.96 ^c	1.04 ^{bc}	1.01 ^{bc}	1.06 ^{ab}	1.14 ^a	0.03

^{a,b,c,d} Means in the same row with different superscripts are significantly ($P < 0.05$) different.

Table (5): Effect of sunflower oil supplementation on bone chemical analysis of Muscovy ducks at the ages of 12 weeks.

Item	Sunflower oil addition levels			SE
	0.0%	5.0%	7.5%	
Bone ash %	42.77 ^a	41.86 ^{ab}	40.84 ^b	0.32
Ca %	28.14 ^a	26.92 ^b	25.72 ^c	0.32
P %	14.37 ^a	13.92 ^b	13.63 ^b	0.11
Ca / P ratio	1.96 ^a	1.93 ^a	1.89 ^{bc}	0.01

^{a,b,c} Means in the same row with different superscripts are significantly ($P < 0.05$) different.

Bone ash decreased with increasing sunflower oil level supplementation to the diet (Table 5). The decrease in ash content of was significant at 7.5 % level of sunflower oil. Calcium and phosphorus percentage had the same trend. They significantly decreased with increasing sunflower oil level supplementation in the diets of Muscovy ducks. These results are in good accordance with the results obtained in broilers by *Abd-Alla (1988)*. This reduction may be due to soap formation with fatty acids (*Ahmed et al., 1995*). While, Ca : Ph ratio was not affect significantly by adding 5.0 % level of sunflower oil, and decreased by adding 7.5 % level of sunflower oil.

Table (6) shows that body circumference and thigh length significantly increased by increasing sunflower oil levels, while, shank length was not affected significantly by sunflower oil supplementation. The significant increase in body circumference and thigh length was higher at 12 weeks than at 8 weeks of age by adding 5.0 % level of sunflower oil.

Table (6): Effect of sunflower oil supplementation on body measurement (cm) of Muscovy ducks at the ages of 8 and 12 weeks.

Item	Age of 4 weeks		Age of 12 weeks			SE
	Sunflower oil addition levels					
	0.0%	5.0%	0.0%	5.0%	7.5%	
Body circumference	16.88 ^c	18.50 ^{abc}	18.00 ^b c	19.75 ^{ab}	20.50 ^a	0.68
Shank length	75 ^a	75 ^a	75 ^a	75 ^a	75 ^a	4.7
Thigh length	75 ^{bc}	73 ^{ab}	25 ^c	25 ^a	63 ^a	9.8

^{a,b,c} Means in the same row with different superscripts are significantly ($P < 0.05$) different.

Generally, sunflower oil supplementation to the diets of ducks improved growth rate and caused an increase in final body weight, body measurements and deboning %. It also reduced feed consumption. This conclusion was in good agreement with the findings of *Ahmed and Mahgraby (1994)* who pointed out that fat supplementation to ducks diet caused an increase in body weight and improved feed utilization and carcass quality. On the other hand, *Mateos et al. (1982)* found that supplemental fat increased transit time of ingesta in chickens. This may improve digestibility of other dietary constituents and thereby increases the utilization of dietary energy that was reflected in productive responses.

Effect of sunflower oil supplementation on the relative weight of digestive tract and its parts are shown in Table (7). Results indicated that adding sunflower oil to birds' diets at a level of 5.0 % resulted in a significant decrease in relative weight of digestive tract at 8 weeks of age (2.5 %). At 12 weeks of age the relative weight of digestive tract slightly decreased. The decrease was 1.03 and 0.32 % by adding 5.0 % and 7.5 % of sunflower oil, respectively. It can be concluded that sunflower oil supplementation caused a decrease in relative weight of digestive tract as a result of increasing live body weight as compared to the control groups (Table 7). Results indicated that ducks fed 5.0 % sunflower oil at 8 weeks of age had slight increase in relative weight of esophagus and crop, but, this increase was not significant (0.1 %). While, the relative weights of esophagus and crop significantly decreased at 12 weeks of age by adding sunflower oil. The decrease was 1.1 % and 2.3 % by adding 5.0 % and 7.5 % level of sunflower oil supplementation, respectively. The relative weights of proventriculus and gizzard at 8 weeks of age were significantly increased by using 5.0 % level of sunflower oil as compared to the control group (Table 7). These increases were 1.5 % and 8.9 % in proventriculus and gizzard, respectively. At 12 weeks of age, the relative weight of proventriculus fluctuated by adding 5.0 % and 7.5 % whereas, the relative weight of gizzard significantly increased with sunflower oil supplementation, the increases were 4.4 % and 3.3 % by adding 5.0 % and 7.5 % sunflower oil, respectively. The relative weights of duodenum and jejunum and ileum significantly decreased at 8 and 12 weeks of age by adding 5.0 % or 7.5 % level of sunflower oil. The reduction in relative weight of duodenum was 4.3 % at 8 week of age. While, that were 1.3 % and 2.3 % by adding 5.0 % and 7.5% level of sunflower oil, respectively at 12 week of age. However, the reduction in relative weights of jejunum and ileum was 9.1 % at 8 week of age and 0.6 % and 2.9 % by adding 5.0 % and 7.5 % level of sunflower oil, respectively, at 12 week of age (Table 7). Results indicated that, the relative weights of caecum and rectum were not affected significantly by sunflower oil supplementation to the diet (Table 7). However, relative weights of caecum and rectum tended to decrease by increasing sunflower oil level at 8 and 12 weeks of age. Also, results showed that, the relative weight of pancreas was significantly decreased by about 0.3 % by adding 5.0 % level of sunflower oil at 8 weeks of age. While, the relative weight of pancreas was significantly increased by about 0.4 % and 1.1 % by adding 5.0 % and 7.5 % level of sunflower oil, respectively at 12 week of age. The relative weight of liver increased significantly with sunflower oil supplementation. This increase was 4.6 % at 8 week of age by adding 5.0 % fat, while, the increase was 1 % and 4.8 % by adding 5.0 % and 7.5 % level of sunflower oil, respectively at 12 week of age. Average absolute length of digestive canal at 8 and 12 weeks of age in Muscovy ducks are presented in (Table 8). There was an increase (8.5 cm) at 8 week of age by adding 5.0 % level of sunflower oil. While at 12 week, the absolute length of digestive canal decreased by about 4.5 cm by adding 5.0 % level of sunflower oil then increased by about 7.3 cm by adding 7.5 % of

sunflower oil. However, the differences in the length of digestive canal due to sunflower oil level were not significant (Table 8). Results indicated that, the relative length of oesophagus and crop was significantly decreased by about 1.7 % with adding 5.0 % level of sunflower oil at 8 weeks of age. The relative length of oesophagus and crop also, significantly decreased by about 0.8 % and 2.1 % by adding 5.0 % and 7.5 % level of sunflower oil, respectively. The relative lengths of proventriculus and gizzard were not affected by sunflower oil supplementation. However, the relative length of duodenum was slightly decreased by about 0.8 % by adding 5.0 % level of sunflower oil at 8 week of age. While, at 12 week of age the relative length of duodenum was slightly increased by about 1.9 % and 0.8 % by adding 5.0 % and 7.5 % level of sunflower oil, respectively.

Table (7): Effect of sunflower oil supplementation on relative weight of different parts of digestive tract of Muscovy ducks at the ages of 8 and 12 weeks.

Item	Age of 4 weeks		Age of 12 weeks			SE
	Sunflower oil addition levels					
	0.0%	5.0%	0.0%	5.0%	7.5%	
Live body wt., g	2550 ^a	2570 ^a	2848 ^a	3008 ^a	3079 ^a	410
Digestive tract%	11.55 ^a	9.08 ^b	9.13 ^b	8.10 ^b	8.81 ^b	0.43
Oesophagus & corp %	3.73 ^b	3.80 ^b	5.14 ^a	3.98 ^b	2.83 ^a	0.23
Proventriculus%	4.55 ^b	6.14 ^a	4.47 ^b	4.31 ^b	4.78 ^b	0.30
Gizzard %	23.55 ^b	32.47 ^a	27.77 ^a	32.15 ^a	31.05 ^a	1.49
Duodenum %	9.88 ^a	5.64 ^c	7.08 ^b	5.75 ^c	4.84 ^c	0.32
Jejunum & ilium %	21.90 ^a	12.80 ^d	16.50 ^b	15.87 ^{bc}	13.60 ^{cd}	0.78
Caecum %	3.04 ^a	2.57 ^a	2.39 ^a	2.42 ^a	1.83 ^a	0.12
Rectum %	2.38 ^a	1.99 ^a	2.22 ^a	2.03 ^a	2.01 ^a	0.20
Pancreas %	4.03 ^{ab}	3.76 ^b	3.24 ^c	3.67 ^b	4.32 ^a	0.13
Liver %	26.00 ^c	30.62 ^b	31.00 ^b	32.00 ^b	35.82 ^a	1.10

^{a,b,c,d} Means in the same row with different superscripts are significantly ($P < 0.05$) different.

The relative length of jejunum and ileum increased significantly with sunflower oil supplementation by level of 5.0 %. This increase was 4 % at 8 week of age. But, at 12 week of age fluctuated trend was found with sunflower oil addition by 5.0 % and 7.5 %. It was decreased by about 2.3 % by adding 5.0 % level of sunflower oil then increased by about 0.7 % by adding 7.5 % level of sunflower oil. Results in Table (8) showed that, feeding birds diets with sunflower oil level of 5.0 % or 7.5 % did not affect on the relative length of large intestine at 8 and 12 weeks of age. It can be concluded that sunflower oil supplementation caused differences in the relative length of digestive tract's parts. These differences were reflected on the relative weights of digestive tract.

Effect of fat on the hydrogen ion concentration of the contents of the different digestive tract's parts in Muscovy ducks are shown in Table (9). Generally, results indicated that the pH of all different parts of digestive tract were decreased with sunflower oil supplementation, except the pH of small intestine which increased with the same level of sunflower oil supplementation. It can be observed that the pH of oesophagus and crop decreased significantly by adding 5.0 % level of sunflower oil at 8 and 12 weeks of age as compared by control group. While, the pH value of oesophagus and crop increased with 7.5 % level of sunflower oil at 12 week of age. The same trend was found in the pH value of proventriculus.

Table (8): Effect of sunflower oil supplementation on Absolute length (cm) of digestive tract and relative length of its parts of Muscovy ducks at the ages of 8 and 12 weeks.

Item	Age of 4 weeks		Age of 12 weeks			SE
	Sunflower oil addition levels					
	0.0%	5.0%	0.0%	5.0%	7.5%	
Digestive tract	21250. ^a	22100. ^a	22200. ^a	21750. ^a	22925. ^a	11.7
Oesophagus&corp %	1090. ^{ab}	917. ^b	11.32 ^a	1045. ^{ab}	927. ^b	0.57
Proventriculus %	356. ^a	322. ^a	291. ^a	291. ^a	342. ^a	0.27
Gizzard %	2.97 ^a	2.82 ^a	2.68 ^a	2.86 ^a	275. ^a	0.24
Duodenum %	19.20 ^a	1835. ^a	1302. ^b	1490. ^c	1382. ^b	0.66
Jejunum & ilium %	5647. ^c	60.45 ^b	64.52 ^a	62.15 ^{ab}	6517. ^a	1.12
Caecum %	750. ^a	958. ^a	769. ^a	742. ^a	621. ^a	102.
Rectum %	607. ^a	600. ^a	542. ^a	634. ^a	546. ^a	0.32

^{a,b,c} Means in the same row with different superscripts are significantly ($P < 0.05$) different.

Wiseman (1984) reported that the addition of linseed oil to the diet caused a decrease in the pH, mainly because of the depression in acetic and butyric acids and increased production of propionic acid. The pH of gizzard content was not affect significantly by sunflower oil supplementation (Table 9). Slight decrease was obtained at 8 and 12 weeks of age by adding 5.0 % and 7.5 % of sunflower oil supplementation. The decrease in pH of gizzard may be due to the decrease in feed intake that observed in birds feed diet supplemented with sunflower oil, and this may be attributed to the rate of HCl secretion. The pH of duodenum was slightly increased by adding 5.0 % and 7.5 % levels of sunflower oil at 8 and 12 weeks of age. Also, adding 5.0 % and 7.5 % level of sunflower oil at 8 and 12 weeks of age significantly increased the pH of jejunum and ileum (Table 9). Sunflower oil supplementation may be associated by the increase of pancreatic and bile secretion that increases the pH values of duodenum, jejunum and ileum.

Table (9): Effect of sunflower oil supplementation on pH values of the contents of the different parts of the digestive tract of Muscovy ducks at the ages of 8 and 12 weeks.

Item	Age of 4 weeks		Age of 12 weeks			SE
	Sunflower oil addition levels					
	0.0%	5.0%	0.0%	5.0%	7.5%	

Oesophagus&corp	459. ^a	409. ^b	4.69 ^a	419. ^b	461. ^a	0.06
Proventriculus	329. ^b	327. ^b	359. ^a	334. ^{ab}	339. ^a	0.02
Gizzard	2.25 ^a	2.20 ^a	2.50 ^a	2.23 ^a	225. ^a	0.04
Duodenum	615. ^{ab}	621. ^a	607. ^c	609. ^{bc}	609. ^{bc}	0.03
Jejenum & ilium	653. ^b	6.70 ^a	6.34 ^c	6.46 ^c	642. ^c	0.02
Caecum	577. ^{bc}	500. ^d	562. ^d	571. ^{cd}	580. ^b	0.03
Rectum	671. ^a	667. ^a	669. ^a	671. ^a	671. ^a	0.08

^{a,b,c,d} Means in the same row with different superscripts are significantly ($P < 0.05$) different.

The pH of caecum decreased significantly by adding 5.0 % level of sunflower oil as compared by control group. While, it was increased significantly by adding 5.0 % and 7.5 % level of sunflower oil at 12 weeks of age. The pH of rectum decreased by adding 5.0 % level of sunflower oil at 8 week of age, while it was slightly increased by adding 5.0 % and 7.5 % level of sunflower oil as compared by control group.

REFERENCES

- Abd-Alla, A.G. (1988). Effect of different oil/fat source and levels on the performance of Arbor Acres broiler chicks. M.Sc. Thesis, College of Agric., Cairo Univ., Egypt.
- Abd El-Ghani, I.A. (1986). Studies on meat production in poultry. Ph.D. Thesis, College of Agric., Cairo Univ., Egypt.
- Abdel-Samee, M.O. (1998). Nutritional studies on broiler performance under hot environmental conditions. Ph.D. Thesis, College of Agric., Cairo Univ., Egypt.
- Ahmed, Nagwa A. and Nagwa A. Maghraby (1994). Performance and carcass quality of Muscovy ducklings fed supplementation fats by age sequence during summer season. Egypt. J. Anim. Prod. Vol. 31, Supplement Issue, Nov. pp. 577.
- Ahmed, Nagwa A., Nagwa A. Maghraby and M.A. Kicka (1995). Duodenal calcium absorption, egg shell quality and bone ash as affected by vegetable oil content in the diet of laying hens. J. Agric. Sci., Mansoura Univ., 20:1111.
- Alao, S.J. and D. Balnave (1984). Growth and carcass composition of broiler fed sunflower oil and olive oil. British Poultry Sci., 25:209.
- Allam, Sabbah. M., M.A. Kicka and O.M. El-Hussieny (1982). Tallow supplementation in poultry nutrition. Egypt. J. Anim. Prod. 22:143.
- A.O.A.C. (1984). Association of Official Analytical Chemists. Official Methods of Analysis. 12 th Ed., Washington, D.C., USA.
- Arram, G. (1984). The biological and physiological values of different rations in relation to body composition. Ph.D. Thesis, College of Agric., Cairo Univ., Egypt.
- Desoke, A.A.M. (1986). Physiological studies on fat metabolism in poultry. M.Sc. Thesis, College of Agric., Cairo Univ., Egypt.
- Duncan, D.B.(1955).Multiple range and multiple F-test. Biometrics, 11:1.

كلنا نباع مبارك

- Mateos, G.G.; J. Sell and A.E. Jennifer (1982). Rate of food passage (Transit Time) as influenced by level of supplemental fat. Poultry Sci., 61:94.
- MSTAT (1986). Computer software for statistical analysis. Version o/em. Copyright June 1982-1986. Michigan Univ. Revised 7/1/1986 by Dept. of Crop and Soil Sci., Michigan Univ., USA.
- Nitsan, Z.; A. Dvorin; Z. Zoref and S. Mokady (1997). Effect of added soyabean oil and dietary energy on metabolisable and net energy of broiler diets. British Poultry Sci., 38:101.
- Salmon, R.E. (1969). Soyabean versus rapeseed oil in turkey starter diets. Poultry Sci. 48:87.
- Waldroup, P.W. (1981). Energy levels for broilers. J. Am. Oil Chem. Soc., 58:309.
- Wiseman, J. (1984). Fats in animal nutrition (Role of essential fats). No. 7, pp.153.

تأثيرات إمداد الغذاء بالدهن على مقاييس مكونات الجسم في البط المسكوفي شكري طنطاوى⁽¹⁾، أمينة خضر⁽²⁾، نجوى أحمد⁽¹⁾، عبدالعزيز البدرى⁽²⁾ 1- قسم الإنتاج الحيواني - كلية الزراعة - جامعة القاهرة. 2- قسم تربية الأرناب - معهد بحوث الإنتاج الحيواني - وزارة الزراعة.

لقد تم استخدام عدد مائتين (200) من البط المسكوفي عند عمر 5 أسابيع و تقسيمهم عشوائيا إلى ثلاث (3) مجموعات : مجموعة (1) تم تغذية أفرادها على عليقة المقارنة طوال فترة التجربة (12 أسبوع)، مجموعة (2) تم تغذية أفرادها على عليقة المقارنة مضاف إليها زيت عباد الشمس بجرعة قدرها 5.0 % من عمر 5 أسابيع حتى 12 أسبوع ، مجموعة (3) تم تغذية أفرادها مثل المجموعة (2) حتى عمر 8 أسابيع ثم من عمر 9 حتى عمر 12 أسبوع تم تغذية أفرادها على عليقة المقارنة مضاف إليها زيت عباد الشمس بجرعة قدرها 7.5 % . هذا و لقد تم تقديم العليقة و الماء للطيور حسب حاجتها دون تحديد الكمية. هذا و تم تسجيل وزن الجسم الحى للطيور أسبوعيا منذ الفقس و حتى نهاية التجربة. كما تم تسجيل الوزن المتحصل عليه و كمية الغذاء المستهلكة (جم / طائر) و معامل تحويل الغذاء (جم غذاء / جم وزن جسم متحصل). و لقد تم أخذ ذكرين و اثنتين عشوائيا من البط من كل مجموعة عند عمر 4 ، 8 ، 12 أسبوع لتقدير مكونات الجسم و الذبيحة. و لقد تم تسجيل وزن الطائر قبل الذبح. و بعد الذبح تم تجويف الطيور المذبوحة و الحصول على المقاييس التالية : محيط الجسم ، طول الساق ، طول الفخذ بالإضافة إلى الأوزان المطلقة و النسبية للذبيحة و الأحشاء المأكولة (القونصة - القلب - الكبد) و الرقبة و الأجزاء غير المأكولة (الدم - الريش - القناة الهضمية - الرأس - الأرجل) و الأحشاء و دهن البطن. كما تم تقدير النسبة المئوية للتصافى و للأحشاء و الرقبة و الأجزاء المأكولة و غير المأكولة و الذبيحة المخلية، و تم تقدير التحليل الكيميائى (رطوبة - دهن - بروتين - رماد) للحم الصدر و الفخذ. كما تم تقدير الأطوال المطلقة و النسبية للقناة الهضمية الفارغة و أجزاءها المختلفة.

و لقد أظهرت النتائج أن الأمداد بزيت عباد الشمس عند عمر 8 و 12 أسبوع سواء بالجرعة 5 % أو 7.5% تسبب في أحداث زيادة معنوية في وزن الجسم الحى و النسبة المئوية للذبيحة و التصافى و دهن البطن و القونصة و دهن الذبيحة و رماد الفخذ و محيط الجسم و طول الفخذ و درجة حموضة محتويات الأمعاء الدقيقة ، كما تسبب في أحداث نقص معنوى في النسبة المئوية للأجزاء غير المأكولة و رطوبة الذبيحة و بروتين الذبيحة و رماد العظم و كالسيوم و فوسفور العظم و الوزن النسبى للأثنى عشر و الأمعاء الدقيقة. هذا و لم يكن للمعاملة بزيت عباد الشمس (سواء بجرعة 5% أو 7.5%) عند عمر 8 أو 12 أسبوع أى تأثير على نسبة الأحشاء و رماد الصدر و طول الساق و الطول النسبى للقونصة و للأمعاء الغليظة و درجة حموضة محتويات القونصة ، إلا أن إضافة زيت عباد الشمس بجرعة قدرها 5% عند عمر 8 أو 12 أسبوع تسببت في نقص النسبة المئوية للكبد و درجة حموضة محتويات القونصة. أما إضافة زيت عباد الشمس بجرعة 7.5% عند عمر 12 أسبوع سببت زيادة معنوية في النسبة المئوية للكبد و القلب و درجة حموضة محتويات القونصة ، كما ثبت أن إضافة زيت عباد الشمس عند عمر 12 أسبوع بالجرعتين 5% و 7.5%

سببت زيادة فى النسبة للذبيحة المخلية و القونصة و البنكرياس و الكبد و درجة حموضة محتويات المستقيم و الأعور و سببت نقص معنوى فى الوزن و الطول النسبى للحوصلة. إن إضافة زيت عباد الشمس بجرعة 5% عند عمر 8 أسبوع تسببت فى زيادة النسبة المئوية للرقبة و القلب و الوزن النسبى للقونصة و الكبد و الطول النسبى للأمعاء الدقيقة ، كما سببت فى نقص الوزن النسبى للقناة الهضمية و البنكرياس و الطول النسبى للحوصلة و درجة حموضة محتويات الأعور و المستقيم.

بصفة عامة فإن إضافة زيت عباد الشمس إلى العليقة يحسن معدل النمو و الهضم و زيادة وزن الجسم النهائى و مقاييس الجسم و النسبة المئوية للذبيحة المخلية و يقلل كمية الغذاء المستهلكة.