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EFFECT OF FEEDING DIETS CONTAINING COTTON SEED OIL ON THE PERFORMANCE OF GROWING JAPANESE QUAIL

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SUMMARY

This experiment was conducted to evaluate the utilization of cottonseed oil(CSO) and its effect on the digestibility of growing quail diets. Three hundred 1-day old Japanese quail were divided equally into 4 groups containing 75 birds each. Each group contained 3 replicates of 25 birds. Levels of CSO added to the diets were 0, 2, 4, and 6%. All diets were iso-caloric and iso-nitrogenous. The experiment was terminated when birds were 6 weeks old. Weight gain, feed intake, feed efficiency, and carcass composition were measured and the digestibility coefficients of nutrients were determined.

In general, it was observed that adding CSO up to 6% of diet did not have any significant effect on body weight, body gain, and feed intake during the expermintal period. However, a slight ($P<0.10$) decrease in body gain was observed by adding CSO during the period from 2 to 4 weeks of age compared to the control diet. Feed efficiencies (gain/feed) were lower ($P<0.04$) by adding CSO compared to the control diet. No significant differences were found in feed efficiencies among the levels of 2, 4, or 6% of CSO.

The maximum value of carcass weight was obtained with the control diet. There was no significant effect on dressing percentage by adding CSO to japanese quail diets. The proportions of abdominal fat, intestine weight, and offal weight as a percent of body weight increased ($P<0.01$) by adding CSO.

The digestibility of dry matter, organic matter, crude protein, ether extract, and nitrogen free extract improved ($P<0.06$) by CSO up to 4% compared with the control diet. The highest ($P<0.05$) crude fiber digestibility was observed at 4% CSO level compared with the other treatments. Generally, adding up to 6% oil had no adverse effect on the digestibility coefficients compared with the control diet.

Accordingly up to 6% of CSO could be substituted into the basal diet of Japanese quail with no depression on growth performance, carcasses composition, or nutrients digestibility.

Keywords : Japanese quail, cottonseed oil, digestibility, growth performance

INTRODUCTION

Feeding fat has been used widely in the ration of broiler chickens (Griffiths *et al.*, 1977; Sibbald, 1978; Coon *et al.*, 1981 and Hullan *et al.*, 1984), turkeys (Salmon,

1974, Whitehead and Fisher, 1975, Sell and Owings, 1984) and ducks (Kamar *et al.*, 1989; Farrel, 1991 and Ahmed and Maghraby, 1994) in order to increase caloric density of feeds and improve efficiency of feed utilization.

The utilization of fat is affected by many factors such as fatty acid composition, age and environmental conditions, ... etc. Corino and Dell'orto (1980) reported that the saturated fatty acids are less utilized than the corresponding unsaturated fatty acids. Polin and Hussein (1982) found that the adult birds recorded a higher utilization for poly saturated fatty acids than young birds. Potter *et al.* (1974); and Klaus De Albuquerque *et al.* (1978) demonstrated that fat addition under high environmental temperature decreased feed consumption and improved feed efficiency.

Fuller and Rendon (1977) carried out two experiments with broiler chicks in which several fats were evaluated. Heat increment and activity were consistently lower in the fat supplemented diets except acidulated cottonseed soapstock and coconut oil. Improved weight gain was obtained in one of the two trials. Caloric efficiency (gross energy gain/ ME consumed) was greater with fat supplemented diet than with low fat diets.

Keren-Zvi *et al.* (1990) found that body fat decreased in broiler chickens by vegetable oil supplementation. Moreover, Donaldson (1985) and Yanovich (1986) reported that adding fat in diets of broiler chickens, ducks and turkeys from soybean, sunflower, sunflower and maize oil or tallow improved body weight gain, feed utilization, and carcass quality.

The present study was done to evaluate the growth performance, feed intake, feed efficiency, carcass composition, and nutrients digestibility coefficients of Japanese quails fed graded levels (0, 2, 4, and 6%) of CSO.

MATERIALS AND METHODS

Three hundred one-day old Japanese quail of both sexes were maintained in electrically-heated quail batteries housed in light and temperature-controlled rooms. Birds were given free access to water and food. The birds were divided into 4 groups (75 quail each) according to CSO addition, i.e. 0, 2, 4, and 6% CSO. Each group contained 3 replicates of 25 birds.

The control diet was formulated to contain adequate levels of nutrients for quails as recommended by the National Research Council (NRC, 1984) with no added fat. Three additional ration treatments were obtained by adding CSO to the control diets at levels of 2, 4, and 6%. The ration formulas were adjusted to be iso-caloric and iso-nitrogenous. Composition of the diets is shown in Table 1.

Body weight and feed consumption were measured for birds biweekly and feed efficiency values(gain/feed) were calculated. At the end of the experiment (6 weeks), 2 birds from each replicate were randomly chosen and sacrificed after 12 hours fasting for carcass characteristic measurements.

A digestion experiment was done to evaluate the nutrients digestibility of the tested diets. Five adult male birds from each treatment were housed individually and fed on the tested diets. After 3 days acclimatization period, the digestion experiment phase continued for 6 days. Feed intake was measured. Excreta output was collected daily, oven dried (70^{o}C/24 hours), ground and representative samples were used for analysis.

The chemical analysis of diets and excrera for dry matter(DM), ether extract(EE), crude protein(CP), crude fiber(CF), and ash were conducted according to A.O.A.C. (1984). For calculating CP digestibility, the fecal protein was determined according to Ekman *et al.* (1949). ANOVA and LSD procedures were performed as outlined be Snedecor and Cochran (1980).

Table 1 : Composition and calculated analysis of the experimental diets.

Ingredient	Added cotton seed oil , %			
	0	2	4	6
Ground corn	56.00	52.50	47.75	42.25
Wheat bran	8.00	9.25	12.00	15.75
Soy bean meal (44%CP)	25.75	26.00	26.00	25.75
Broiler concentrate (52%CP)	10.00	10.00	10.00	10.00
Vegetable fat	-----	2.00	4.00	6.00
Vitamin[1] and mineral premix[2]	0.25	0.25	0.25	0.25
Total	100	100	100	100
Proximate analysis				
Crude protein (%)	24.04	24.09	24.14	24.08
Crude fiber(%)	4.18	4.21	4.40	4.68
Calculated analysis				
Metab.energy (kcal/kg)	2813	2874	2886	2889
Calcium (%)	1.05	1.06	1.06	1.07
Phosphorus (%)	0.52	0.54	0.56	0.55
Methionine + cystine,(%)	0.81	0.81	0.80	0.79
Lysine (%)	1.31	1.31	1.31	1.31

1) Vitamin mixture MTS-74 supplied (per kilogram of mixture) 4,400,000 IU vitamin A acetate; 1,650,000 ICU vitamin D3; 5,500 IUvitamin E acetate; 1.1 g menadione dimethylpyrimidinol bisulfite; 2.65 g riboflavin, 4.0 g d-calcium pantothenate; 26.5 g niacin; 198.4 g choline chloride; 4 mg vitamin B_{12}; 22 gm folic acid; .55g pyridoxine; 22 mg biotin.
2) Trace mineral mix provided the following per kilogram diet: 72mg manganese, 72 mg zinc, 24 mg iron, 3.6 mg copper, 1.44 mg iodine, and .192 mg selenium.

RESULTS AND DISCUSSION

The effects of dietary treatments and age on body weight, body gain, feed intake, and feed efficiency (gain/feed) are shown in Table 2. Body weight was not affected by increasing CSO levels in the basal diet during the experiment. In general, it was observed that body gain was reduced by adding CSO during the periods from 2 to 4 wk ($P<.10$) and 4 to 6 wk ($P<.09$). No significant differences appeared in body gain or feed intake among treatments during the period from 0 to 6 weeks of age.

Waldroup *et al.* (1976) found that broilers fed high energy diets (added fat) consumed proportionally larger amounts of energy and converted the extra consumed energy to body weight gain with no change in caloric efficiency.

The reduction in body gain by adding CSO resulted in lower feed efficiency ($P<0.04$) for birds fed on fat supplemented diets as compared with the control diet during the period from 0 to 6 weeks of age. On the other hand, Ahmed and Maghraby (1994) found that adding fat to Muscovy ducklings basal diet improved feed conversion, specially for group fed Animal-vegetable fat blend.

Table 2. Body weight, body gain, feed intake, and feed efficiency (mean ±SE) of Japanese quail fed cotton seed oil.

Item	Age (week)	Cotton seed oil levels(%) 0	2	4	6	LSD	P value
Body weight (gm/bird)	0	8.99a ±0.281	8.89a ±0.238	8.99a ±0.22	8.32a ±0.19	0.88	0.282
	2	45.95a ±2.77	48.19a ±0.55	47.50a ±5.20	48.09a ±1.90	11.86	0.962
	4	96.34a ±4.96	88.86a ±3.6 9	92.37a ±2.71	84.21a ±2.72	19.91	0.536
	6	155.00a ±3.20	147.60a ±2.86	146.43a ± 3.78	132.60a ±4.39	24.45	0.256
Body gain (gm/bird)	0 to 2	36.96a ±3.02	39.29a ±0.35	38.51a ±5.42	39.78a ±1.77	12.34	0.946
	2 to 4	50.38a ±2.77	40.67ab ±3.69	44.77ab ±4.23	36.02b ±1.63	11.87	0.100
	4 to 6	58.66a ±2.34	58.77a ±0.83	54.06ab ±3.36	48.47b ±1.93	9.04	0.091
	0 to 6	146.01a ±3.44	138.73a ±2.95	137.44a ±2.98	124.26a ±4.21	24.82	0.287
Feed intake (gm/bird)	0 to 2	95.37a ±2.25	91.43a ±5.95	87.92a ±7.65	101.43a ±12.00	23.63	0.575
	2 to 4	172.57a ±7.11	174.10a ±9.57	182.58a ±3.82	160.47a ±7.13	34.82	0.528
	4 to 6	245.26a ±8.04	262.77a ±10.38	238.44a ±13.16	204.43a ±9.03	80.48	0.417
	0 to 6	513.23a ±10.23	528.19a ±13.60	509.27a ±11.81	466.33a ±12.05	69.47	0.491
Gain/feed	0 to 2	0.388a ±0.037	0.433a ±0.030	0.435a ±0.041	0.399a ±0.033	0.130	0.778
	2 to 4	0.291a ±0.004	0.240ab ±0.03	0.245ab ±0.018	0.225b ±0.012	0.051	0.060
	4 to 6	0.239a ±0.012	0.226b ±0.02	0.232b ±0.012	0.237b ±0.005	0.095	0.060
	0 to 6	0.284a ±0.002	0.262ab ±0.002	0.269b ±0.008	0.263b ±0.010	0.015	0.040

a,b, and c Data in the same row followed by unlike letters differ significantly (P< 0.05).

Reported in Table 3, are the effect of feeding different levels of CSO on carcass composition (weight of carcass, edible parts, abdominal fat, intestine, and offal and its proportions of body weight). There were no significant difference amoung all treatments in dressing percentage. Increasing CSO level in the basal diet up to 6% recorded the best value of the proportion of edible parts. The proportions of abdominal fat, intestine, and offal weight were improved significantly (P<0.01) by increasing fat levels in the diet.

Ahmed and Maghraby (1994) reported that ducks fed on oil in their diets resulted in more abdominal fat and higher weight of liver. Also, Deaton *et al.* (1981) observed

that feeding broiler chicks on a diet supplemented wi4 to 7% tallow increased abdominal fat of the carcass.

Table 3. Carcass characteristics of Japanese quail fed on diets contained cotton seed oil

Measurement	Cotton seed oil levels (%)				LSD	P value
	0	2	4	6		
Live body weight	154.20a	143.42ab	150.43ab	133.21b	17.32	0.090
SE	±3.121	±8.26	±5.09	±5.24		
Carcass weight	108.57a	99.59a	102.80ab	88.15b	13.26	0.040
SE	±2.87	±7.09	±2.52	±4.17		
Edible parts weight	9.71a	8.57a	9.62a	9.47a	2.110	0.498
SE	±0.37	±0.43	±0.95	±0.39		
Abdominal fat	0.050a	0.417b	0.590b	0.737b	0.355	0.015
SE	±0.023	±0.093	±0.182	±0.068		
Intestine weight	9.97a	9.93a	10.66a	13.25b	1.449	0.004
SE	±0.37	±0.53	±0.91	±0.50		
Offal weight	20.14a	19.96a	20.33a	22.87b	2.058	0.030
SE	±0.33	±1.05	±1.18	±0.729		
	----------	----------	%----------	----------		
Dressing	70.40a	69.47a	68.40a	66.12a	4.310	0.198
SE	±0.62	±1.34	±1.14	±1.43		
Edible parts	6.30a	5.99ab	6.38bc	7.35c	1.358	0.183
SE	±0.27	±0.17	±0.54	±0.46		
Abdominal fat	0.033a	0.296b	0.385bc	0.557c	0.232	0.008
SE	0.015	±0.075	±0.111	±0.069		
Intestine	0.619a	0.683b	0.709b	0.993b	0.106	0.006
SE	±0.015	±0.234	±0.029	±0.041		
Offal weight	13.08a	14.01a	13.52a	17.14b	0.980	0.010
SE	±0.27	±0.72	±0.62	±0.32		

[a,b, c] Data in the same row followed by unlike letters differ significantly (P<0.05).

The digestibility coefficients of DM, OM, CP, EE, CF, and the nitrogen free extract (NFE) are reported in Table 4. There were no significant differences in DM, OM, or NFE between 0, 2, or 6% treatment groups. While, adding 4% oil to the control diet improved (P<0.05) the digestibility of these measurements in comparison with other treatments. Increasing CSO level up to 4% resulted in increasing (P<0.05) EE, and CF digestibility. The highest (P<0.01) value of CP digestibility was observed at 4% CSO level compared with other treatments. In general, there were no significant differences between the high level of fat (6%) and the control diet in DM, OM, CP, EE, CF, and NFE digestibilities.

The utilization of fat by poultry depends on the degree of fatty acids saturation as well as the age of birds. The improvment in the nutrient digestibility for birds fed on vegetable fat might be due to the fact that poly unsaturated fatty acids are better utilized by bird than the poly saturated fatty acids (Pinchasov and Nir, 1992)

In conclusion, CSO could be added up to 6% in the diets for growing Japanese quail, without a marked depression in body gain, feed efficiency, and dressing

percentage.

Table 4. Nutrients digestibility coefficients of Japanese quail fed on diet contained cotton seed oil

Item	Cotton seed oil levels (%)				LSD	P value
	0	2	4	6		
Organic matter	59.18a	55.80a	68.29b	57.88a	6.97	0.019
SE	±2.54	±1.95	±1.54	±0.43		
Crude protein	79.91a	74.57b	85.91c	79.49a	3.69	0.010
SE	±1.23	±1.50	±0.54	±1.39		
Ether extract	70.86a	68.65a	80.67b	75.06ab	9.14	0.069
SE	±0.07	±1.91	±3.93	±2.88		
Crude fiber	63.38ab	58.60a	73.35b	59.06a	10.68	0.047
SE	±5.39	±1.21	±3.78	±1.76		
N free extract	40.30a	39.79a	53.14b	39.64a	10.21	0.044
SE	±3.62	±2.97	±2.43	±0.81		

a,b,c Data in the same row followed by unlike letters are differ significantly at($P<0.05$)

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تأثير تغذية العلائق المحتويه زيت بذرة القطن على مستوى الأداء فى السمان اليابانى النامى

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أجريت هذه التجربه بهدف تقيم اضافة زيت بذرة القطن على معدلات النمو ومعاملات الهضم فى علائق السمان النامى. واستخدم فى هذه التجربه ٣٠٠ سمانة عمر يوم قسمت الى أربع معاملات (صفر ، ٢، ٤، ٦٪) زيت بذرة القطن وكل معاملة احتوت على ثلاث مكررات. وتم دراسة معدلات النمو والمستهلك من الغذاء والكفاءة التحويل للغذاء ومعاملات الهضم.

وأوضحت الدراسه أن اضافة زيت بذرة القطن حتى معدل ٦٪ الى العلائق لم يؤثر على وزن الجسم أو المأكول من الغذاء خلال فترة التجربة بينما انخفضت كفاءة تحويل الغذاء معنويا باضافة الزيت الى العلائق بالمقارنة بالكنترول أعلى معدل لوزن الذبيحة حققته عليقة الكنترول ولم يحدث اضافة الزيت أى تغير معنوى فى نسبة التصافى بينما أحدث زيادة معنويه فى وزن دهن البطن والامعاء والاجزاء الغير مأكوله.

تحسنت معاملات هضم الماده الجافة والعضوية والبروتين الخام والدهن الخام والمستخلص الخالى من الأزوت باضافة الزيت حتى مستوى ٤٪ باللمقارنة بالعليقة القياسية وعلى ذلك فان اضافة زيت بذرة القطن حتى مستوى ٦٪ ليس له أى تأثير ضار على معدلات النمو أو مواصفات الذبيحةأو معاملات الهضم