

EFFECTS OF INCLUSION HOT PEPPER AND / OR FENUGREEK IN BROILER DIET ON THEIR PERFORMANCE , CARCASS CHARACTERISTICS AND BLOOD CONSTITUENTS .

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ABSTRACT

The present work was designed to investigate the effects of mixing hot pepper and fenugreek on broiler. A total of 150 unsexed seven day old Cubb broiler chicks were randomly distributed into five treatment of 30 chicks each , in three replicates (10 chicks per each replicate) for each experiment , birds fed starter diets containing 23 % CP and grower diets containing 21 % CP . Five experimental diets were formulated to contain (Control diets (T1) , 2 % hot pepper (T2) , 1.5 % hot pepper + 0.5 % fenugreek (T3) , 1 % hot pepper + 1 % fenugreek (T4) and 0.5 % hot pepper + 1.5 Fenugreek (T5)) .

Results of this study indicated that adding 2% of hot pepper gave the best body weight and body weight gain compared with other treatments .

Hot pepper significantly reduce abdominal fat , total lipids , cholesterol , triglycerides , glucose , calcium and GOT . These results indicate that addition of hot pepper and fenugreek to foods could reduce adiposity . There were no significant effect on total protein , albumin , GPT and phosphorus in blood serum with different treatment .

It is suggested that fenugreek and hot pepper could be used individually but not together to improve the performance of broiler chicks .

Key words : hot pepper - fenugreek - blood constituents - carcass - performance lipids - cholesterol -

INTRODUCTION

The European community are refining their use of organic acids , direct microbial , oligosaccharides , enzymes and other additives . Moreover , they are adopting new forms of " all natural " feed additives that are the products of modern science , but have their origins in traditional even ancient human medicine .

This new generation of growth enhancers includes " botanical " additives proprietary blends of herbs or plant extracts . Many botanical ingredients have a long history even prehistory in preventing or treating human illness .

However , even a single ingredient in a botanical blend may be consist of many bio - active chemical compounds . Scientists now are working to better define the most useful herbs and plant extracts and to quantify what reliable effects they can have in animal production (Gill , 1999) .

Only limited works have been done with hot pepper as feed additives for broiler chicks . In one of the first studies , Williams and Kienholz (1974) , who reported that feeding chili , curry , or black pepper powders at 1.5 , 3.0 , 6.0 , or 12 % of the diet . There were sharp decreases in growth rates as the dietary levels of black pepper increased . Chili powder had little effect on growth rate , feed efficiency or food consumption except that 12% level significantly reduce growth to 84 % of the control . Curry powder was slightly more detrimental than chili powder for chicks . The 12 % dietary level reduced growth to 75 % of control bird growth . An analysis of fenugreek seeds from sp. Indica and Mediterranean (from various sources) and their hybrids was reported . The seeds had a high protein content (29.4 %) and a low lipid content (6 %) and they showed medium trypsin and chymotrypsin inhibitor activities . They could be used as animal feed (Benken , *et . al .* 1990) . In early study , Sharaf , *et . al .* (1976) reported that fenugreek seeds were a bitter stomachic , tonic and nutritive food for animals . Therefore , they studied the effect of prolonged administration of the fenugreek seeds on the body weight of female albino rats . They found an increase in body weight with crushed fenugreek seeds , when they are used as a supplement to the diets in the order of 0.04 , 4.0 , and 6.0 gm / rat / day for two months .

Red pepper has been used as a common spice for enhancing the palatability of foods and medicinally as a counter irritant . Henry and Emery (1986) investigated the effect of spiced food on the metabolic rate in men , and have shown that the metabolic rate was increased by 25 % when pepper sauce and mustard sauce were added to a meal . However , Kawada , *et . al .* (1988) have reported that the capsaicin , which is a pungent component of hot red pepper , stimulates epinephrine secretion from the adrenal medulla of rats and results in a rapid but transient elevation of the respiratory quotient . They have previous reported that these alteration in the energy metabolism by the administration of capsaicin are specifically inhibited by various β -adrenergic blockers such as propranolol , pindolol , and atenolol . (kawada , *et . al .* , 1986) .

The seeds of fenugreek are reported to have hypoglycemic and hypocholesterolemic effects (Madar and shomer , 1990) . It is well known that the seeds of fenugreek contain relatively large amounts of galactomannan in the endosperm (Reid and Meier , 1970) . The soluble gel fraction of fenugreek seeds constituted the major portion of the seed coat (including the endosperm) polysaccharides , most of which consisted of galactomannan , which mannans : galactose ratio of 1.5 : 1 (Madar and shomer , 1990) .

Several investigators have reported that the ground seed of fenugreek has hypoglycemic and hypocholesterolemic effect , but the factors responsible for this activity have not been identified (Madar and Shomer , 1990) . Ground seeds of fenugreek offered to diabetic rats reduced the postprandial glucose levels (Madar , 1984) . Similar results were reported in alloxan diabetic dogs (Ribes , *et . al .* 1986) . The mechanism by which fenugreek may modulate plasma glucose is by delaying gastric emptying and direct interference with intestinal glucose absorption (Madar , 1984) . In

addition, fenugreek reduced fasting and postprandial blood glucose levels in diabetic patients. It improved peripheral glucose utilization, which contributes to an improvement in glucose tolerance. Thus, fenugreek may exert its hypoglycemic effect by acting on the insulin receptor as well as at the gastrointestinal level (Raghuram, *et. al.* 1994).

In previous research, Azouz (2001) concluded that 2% hot pepper with 2800 kcal had the same effect of the control diet 3000 and 3200 kcal. also, fenugreek improve the using of energy.

The objective of the study reported herein were to evaluate the influence of hot pepper and or fenugreek seeds on live performance, carcass characteristics and blood constituents to reply the question if we adding both hot pepper and fenugreek the energy will improve.

MATERIALS AND METHODS

Experimental design: The present work was designed to investigate the effects of different levels of two local natural feed additives (dried hot pepper and fenugreek seeds) on broiler chicks diets. Table (1) shows the proximate analysis of both additives.

One hundred and fifty, unsexed Cubb broiler chicks at seven days of age obtained from Ismailia Poultry Company were used and were housed in litter. Chicks were randomly distributed into five treatment groups, 30 chicks each, with three replicates, ten chicks each. Five experimental diets were formulated; Control diet (T1), 2% hot pepper (T2), 1.5% hot pepper + 0.5% fenugreek (T3), 1% hot pepper + 1% fenugreek (T4) and 0.5% hot pepper + 1.5 Fenugreek (T5). These diets were formulated to be nearly iso-nitrogenous (23% CP) during starter period (1-4 weeks of age) and iso nitrogenous (21% CP) during finisher period (4-7 weeks of age), however, the control diet contains 3055 with 2800 kcal / ME. Methionine, lysine, vitamins and mineral mixtures were added to cover the broiler chicks recommended requirements of NRC (1994). Table (2) and Table (3) show the composition starter and finisher diets. Hot pepper and fenugreek served only as percentage of the diet, irrespective of their chemical compositions.

Table (1): The proximate analysis of hot pepper and fenugreek.

Items	Hot pepper	Fenugreek
DM	92.35	90.12
OM	85.23	85.96
CP	14.23	24.57
E.E	13.97	06.69
CF	18.45	05.85
NFE	38.58	48.85
Ash	7.12	3.76

Cited from Azouz (2001).

Table (2) : Composition of starter diets in different treatments .

Ingredients	Control	T2	T3	T4	T5
Yellow corn	60.56	53.82	53.82	53.82	53.82
Soybean meal 44 %	20.18	34.29	34.29	34.29	34.29
Corn gluten meal 62 %	15.51	6.14	6.14	6.14	6.14
Dicalcium phosphate	1.64	1.64	1.64	1.64	1.64
Limestone	1.4	1.4	1.4	1.4	1.4
Salt	0.3	0.3	0.3	0.3	0.3
Vit . and mineral *	0.3	0.3	0.3	0.3	0.3
DL – Methionin	0.11	0.11	0.11	0.11	0.11
Hot pepper	-	2.0	1.5	1.0	0.5
Fenugreek	-	-	0.5	1.0	1.5
Total	100	100	100	100	100
Calculated analysis :					
Energy k cal ME / kg	3055	2800	2800	2800	2800
Protein %	23.0	23.0	23.0	23.0	23.0
Ether extract %	2.47	2.47	2.47	2.47	2.47
Fiber %	3.66	3.66	3.66	3.66	3.66
Calcium %	1.0	1.0	1.0	1.0	1.0
Available phosphorus %	0.45	0.45	0.45	0.45	0.45
Lysine %	1.13	1.13	1.13	1.13	1.13
Methionin + cystine %	0.9	0.9	0.9	0.9	0.9

* *Supplied per kg of diets : vit . A , 12000 IU ; vit . D3 ,2200 IU ; vit . E , 10 mg ; vit . k3 , 2 mg , vit . B1 , 1 mg ; vit . B2 , 4 mg ; vit . B6 ,1.5 mg ; vit . B12 , 10 µg ; Nicotinic acid , 20 mg ; Folic acid 1 mg ; Pantothenic acid , 10 mg ; Biotin , 50 µg ; Cholin chloride , 500 mg ; Copper , 10 mg ; Iron , 30 mg ; Manganese , 55 mg ; Zink , 50 mg ; Iodine , 1 mg ; Selenium , 0.1 mg ; Cobalt , 0.1 mg .

Table (3) : Composition of finisher diets in different treatments .

Ingredients	Control	T2	T3	T4	T5
Yellow corn	67.85	57.99	57.99	57.99	57.99
Soybean meal 44 %	10.75	33.34	33.34	33.34	33.34
Corn gluten meal 62 %	16.66	2.49	2.49	2.49	2.49
Dicalcium phosphate	1.83	1.66	1.66	1.66	1.66
Limestone	1.46	1.39	1.39	1.39	1.39
Salt	0.3	0.3	0.3	0.3	0.3
Vit . and mineral *	0.3	0.3	0.3	0.3	0.3
DL – Methionin	0.19	0.3	0.3	0.3	0.3
Lysine	0.66	0.23	0.23	0.23	0.23
Hot pepper	-	2	1.5	1.0	0.5
Fenugreek	-	-	0.5	1.0	1.5
Total	100	100	100	100	100
Calculated analysis :					
Energy k cal ME / kg	3170	2800	2800	2800	2800
Protein %	21.0	21.02	21.02	21.02	21.02
Ether extract %	2.5	3.64	3.64	3.64	3.64
Fiber %	2.52	2.53	2.53	2.53	2.53
Calcium %	1.0	1.0	1.0	1.0	1.0
Available phosphorus %	0.45	0.45	0.45	0.45	0.45
Lysine %	1.3	1.3	1.3	1.3	1.3
Methionin + cystine %	1.0	1.0	1.0	1.0	1.0

* *Supplied per kg of diets : vit . A , 12000 IU ; vit . D3 ,2200 IU ; vit . E , 10 mg ; vit . k3 , 2 mg , vit . B1 , 1 mg ; vit . B2 , 4 mg ; vit . B6 ,1.5 mg ; vit . B12 , 10 µg ; Nicotinic acid , 20 mg ; Folic acid 1 mg ; Pantothenic acid , 10 mg ; Biotin , 50 µg ; Cholin chloride , 500 mg ; Copper , 10 mg ; Iron , 30 mg ; Manganese , 55 mg ; Zink , 50 mg ; Iodine , 1 mg ; Selenium , 0.1 mg ; Cobalt , 0.1 mg .

Slaughter and sample collection : A number of three broiler chicks per treatment . At the end of the experimental period (seven weeks of age) , were chosen and slaughtered to determine carcass characteristics . The assigned birds were deprived of feed for ten hours prior to slaughter examination , after which they were individually weighted , slaughtered to complete bleeding , followed by plucking the feather . After the removal of head , viscera , shanks , gizzard , liver , heart and reproductive organs , the rest of the body was weighed to determine the carcass weight . The carcass weight included the front part with wings , hind part and neck , was calculated as percentage of live body weight . The giblets included heart , empty gizzard , liver , and the abdominal fat (from the proventriculus surrounding the gizzard down to the cloacae) from each broiler was taken at slaughter , weighted and calculated as percentage of live body weight .

Blood sampling : Blood samples were collected at slaughtering and centrifuged at 3000 r. p. m. for 15 minutes . The serum was preserved in freezer at - 20 °C until the time of analysis . Various chemical analysis were determined with commercial kits and measuring the optical density by spectrophotometer , following the methodology suggested by the procedures .

Performance measurements :

Body weight : total individual live weights were divided by the number of chicks in each replicate to obtain the average live weight per replicate weekly .

Body weight gain : was calculated by subtracting the average initial live weight of chicks for a certain period from the live weight of chicks for a certain period from the live weight at the end of the same period and divided by the number of live chicks to obtain the average live weight gain per chick .

Feed intake : was weekly recorded per chick during the whole experiment .

Feed conversion ratio : was the feed consumed for producing a unit of gain .

Statistical analyses : Data were analyzed by using The General Linear Model Procedure of (SAS , 1994) .

RESULTS AND DISUSSION

Live body weight ranged between 539.14 g and 577 g at 3 weeks of age for control and T5 groups , respectively and between 1508.8g and 1408.17 g at 6 weeks of age for T 2 and T4 groups , respectively (Table 4) . Adding 1.5 % fenugreek and 0.5 % hot pepper at 3 weeks improved body weight .The best treatment was T2 (2 % hot pepper) . Live body weight gain followed the same trend as live body weight where the 2% hot pepper gave the best weight gain value at (1 - 6) weeks compared to the lowest body weight gain for the 1.5 % fenugreek and 0.5 % hot pepper .

Feed intake values were increased for all groups compared to the control while the total feed intake values were reduced but not significantly due to increasing the fenugreek per cent . Therefore , the best feed

conversion value were for the control group (1.51) followed by T2 (1.92) and T5 (1.97) . Nakhla , et . al . (1991) . showed that body weight were depressed in Hisex - type chicks when consumed 10 , 50 and 500 mg fenugreek / kg body weight drinking water. Petit , et . al . (1993) showed that rats fed 10 and 100 mg / day fenugreek per 300 g body weight increased their food intake . Gupta , et . al . (1999) The lowest rate of growth of the animals as well as the the increased blood sugar were reversed almost to the control levels by the *Trigonella* seed powder . Panda , et . al . (1999) the effects of fenugreek seed extract on the alterations in serum thyroid hormone concentrations were studied in adult male mice and rats . Increases thyroxin T4 levels and body weight . Devi , et . al . (2003) showed that fenugreek leaves improved the body weight and liver glycogen . Fenugreek leaves showed a significant effect on key carbohydrate metabolic enzymes in diabetic rats .

Table (4) : The effects of dietary hot pepper and fenugreek mixing on growth and feed conversion of broiler chicks .

Treatment Parameter	T1	T2	T3	T4	T5
Body weight (g) at : 1 week	131.4 + 20.0	129.7 + 16.7	131.7 + 16.9	129.8 + 11.9	130.7 + 17.2
At 4 weeks	539.1 + 15.8	554.6 + 15.8	559.4 + 18.6	548.0 + 13.1	577.0 + 17.3
At 7 weeks	1461.7 + 89.1	1508.8 + 77.0	1493.3 + 82.3	1408.2 + 74.9	1414.8 + 85.5
Body weight gain (g) at : 1- 4weeks	407.7 + 15.1	424.9 + 15.8	427.8 + 25.9	418.2 + 14.1	446.3 + 17.1
4 - 7 weeks	922.6 + 26.7	954.1 + 22.5	933.9 + 26.2	860.2 + 21.4	837.8 + 22.9
1 - 7 weeks	1330.3 + 19.7	1379.1 + 18.4	1361.6 + 22.6	1278.4 + 17.3	1284.1 + 24.7
Feed intake (g) at : 1 - 4 weeks	818.5 + 31.2	1132.7 + 31.0	1079 + 29.3	1065.5 + 23.6	914.5 + 18.5
4 - 7 weeks	1186.8 + 73.1	1519 + 23.4	1730 + 36.5	1747.67 + 41.2	1616.5 + 67.4
1 - 7 weeks	2005.3 + 85.0	2651.7 + 96.5	2809.5 + 103.7	2813 + 101.5	2531 + 95.8
Feed conversion at : 1 - 4 weeks	2.01 + 0.1	2.66 + 0.14	2.52 + 0.07	2.55 + 0.01	2.05 + 0.04
4 - 7 weeks	1.29 + 0.11	1.59 + 0.18	1.85 + 0.06	2.03 + 0.13	1.93 + 0.02
1 - 7 weeks	1.51 + 0.1	1.92 + 0.15	2.06 + 0.09	2.2 + 0.26	1.97 + 0.06

Carcass characteristics

Table (5) : shows that body weight and the dressing percentage live were nearly similar when birds were fed different levels of hot pepper and fenugreek . Liver percentage ranged between 2.24 % and 1.56 % for chicks fed 2 % hot pepper and 1.5 % hot pepper and 0.5 % fenugreek T5

respectively , the differences were significant ($P < 0.05$). Gizzard percentage was not affected by diet treatment in birds fed different levels of hot pepper and fenugreek . The heart percentage increased to 0.59 % for chicks fed diet containing 1.5 % fenugreek and 0.5 % hot pepper . However , the differences were not significant . abdominal fat %decreased with increasing fenugreek percentage . Birds fed T4 and T5 have reduced abdominal fat ($p < 0.01$) comparing with other treatments . Morsy (1995) found that dressing percentage ranged from 68.54 to 77.44 % , with a significant improvement of group fed diet containing 500 g / ton of fenugreek as compared with the control diet . There was no significant difference in the abdominal fat , heart , liver gizzard , pancreas and spleen percentage , between fenugreek and control diet . However , the results showed that , no significant difference in the dressing and carcass weight , when broiler chicks fed diet containing 1000 g / kg of fenugreek as compared with control diet .Moreover , fenugreek diet had no effect on liver , heart and gizzard percentages . An important goal of the poultry meat industry is to improve meat quality to increase consumer acceptability . One improvement is the reduction of excessive fat found in some broiler carcass (Chambers and Fortin , 1984) . An interesting aspect of the present work was the addition of either hot pepper or fenugreek seed to broiler chicks diets significantly decreased the fat and abdominal fat percentage compared with control diet . Mastuo , *et al.* (1996) found that the weight of epididymal adipose tissue was significantly lower ($P < 0.01$)with the addition of capsaicin to high carbohydrate diet than in the control diet . These results indicated that addition of capsaicin to foods reduce adiposity , a phenomenon which can be explained partly by the enhancing effects of capsaicin on energy and lipid metabolism via catecholamine secretion from the adrenal medulla in rats (kawada , *et al.* 1988) . However , fat content of milk decreased slightly in lactating buffaloes fed diet containing 100 and 200 g fenugreek seed than in control diet (El Nor , 1999) . When normal adult male rabbits fed diet without or with 1 g dried green leaves of fenugreek for 8 weeks , lipids in feces increased from 168.35 to 345 . 9 mg / day and sterols in feces from 64 .59 to 105.4 mg / day in those given fenugreek (Chaturvedi and Pant , 1988) .

Table (5) : The effects of mixed hot pepper and fenugreek on carcass yields of broiler chicks .

Treatment Parameter	T1	T2	T3	T4	T5
Dressing %	68.53 + 1.4	68.41 +1.8	69.64 + 0.59	67.73 + 0.0	69.62 +5.66
Heart %	0.45 + 0.009	0.45 +0.007	0.41 +0.006	0.44 +0.009	59.33 + 0.018
Liver %	2.11 ^{ab} + 0.004	2.24 ^b +0.48	1.56 ^a +0.002	1.88 ^{ab} +0.28	2.03 ^{ab} + 0.3
Gizzard %	1.68 +0.008	1.68 + 0.156	1.64 +0.16	1.59 + 0.43	1.84 + 0.2
Abdominal Fat %	0.81 ^b + .003	0.98 ^c +0.004	0.87 ^b + .005	0.18 ^a +0.0	0.0 ^a + 0.0

A , b and c means with different superscripts in the same column differ significantly ($P < 0.05$) .

Blood parameters :

Table (6) : explain that the total protein and albumin were not significantly influenced by the inclusion of hot pepper and fenugreek in the diet of broiler . The levels of total protein ranged between 3.49 g / 100 ml for T3 and 2.93 g / 100 ml for T5 . The serum albumin content ranged between 1.73 g / 100 ml for chicks received control diet (T1) and 2.03 g / 100 ml for those having diet contained 2% hot pepper . It is well known that most plasma proteins are synthesized from amino acids derived from the food or the tissues catabolism (Sturkie , 1976) .

When fenugreek seeds are used in animal nutrition , a qualitative good protein supply as a sufficient intake of vitamin E should be considered in order to compensate the hemolytic effect of fenugreek saponins (El Modfa and koken 1980) . Serum total protein decreased significantly with fenugreek seeds addition to rabbits diets (Rashwan , 1998) .

As fenugreek level increase the total cholesterol and glucose decreased ($P < 0.01$) . The chicks fed fenugreek 1.5 % and 0.5 % hot pepper (T5) recorded the lowest values of total lipids , cholesterol and glucose . While the control diet had the highest values of them . The lipids circulating in the blood are derived from intestinal absorption , synthesis (mainly in the liver) or mobilization from fat depots . They may be classified into several fraction including the cholesterol (Sturkie , 1976) . Khosla , *et al .* (1995) reported that *Trigonella foenum graecum* (fenugreek) was administered at 2 and 8 g / kg to normal and alloxan induced diabetic rats orally . It caused a significant fall ($P < 0.05$) in blood glucose both in normal as well as diabetic rats and the hypoglycemic effect was dose related . Negulesco , *et al .* (1985) determined the effect on plasma total cholesterol and triglycerides , when capsaicin is administered at the dose of 8 mg / animal / day to young female rabbits maintained on a 0.5 % cholesterol diet over a five week experimental period . The data indicate that mammals of the order lagomorpha fed cholesterol rich diets and supplemented with capsaicin show decreased plasma total cholesterol , triglycerides . The mechanism of this effect is probably due to decreased intestinal absorption of the lipids . Sharma , *et al .* (1990) showed that the fenugreek diet significantly reduced cholesterol and triglycerides . Stark and Madar (1993) showed that a reduction in plasma cholesterol levels ranged from 18 to 26 % and a tendency for lower concentrations of liver cholesterol was observed which appear to be saponins that interact with bile salts in the digestive tract . Khosla , *et al .* (1995) reported that *Trigonella foenum graecum* (fenugreek) was administered at 2 and 8 g / kg dose orally to normal and alloxan induced diabetic rats . It produced a significant fall ($P < 0.05$) in blood glucose both in the normal as well as diabetic rats and the hypoglycemic effect was dose related . Sharma , *et al .* (1990) showed that the fenugreek diet significantly reduced cholesterol and triglycerides .

Several investigators have reported that either hot pepper or fenugreek seeds has hypoglycemic and hypocholesterlomic effect (Negulesco , *et al .* 1985 ; Suresh - Babu and Srinivasan , 1993 ; Raghuram , *et al .* 1994 ; Matsuo , *et al .* 1996 ; Rashwan , 1998 and Saito , *et al .* 1999) . Mode of action for the hot pepper and fenugreek seed

have been suggested by previously published studies to be related to galactomannan in the fenugreek seed is the factor which may be of potential benefit of fenugreek seed in controlling plasma glucose and cholesterol levels (Madar and Shomer , 1990) . It was suggested that stimulatory influence of dietary fenugreek seed on adrenal steroidogenesis (Suresh – Babu and Srinivasan , 1993) . However , Madar and Stark (1995) reported that the ethanol extract from fenugreek seeds contained hypocholesterlamic components , which seem to be saponins that interact with bile salts in the digestive tract . Indeed , capsaicin , which is the major pungent principle in various hot pepper enhanced the catecholamine secretion from the adrenal medulla in rats , mainly through activation of the central nervous system (Yoshioka , *et . al .* , 1998) . Therefore , other factors suggested by Yoshioka , *et . al .* (1995) who found that α – adrenergic stimulation might contribute to the alteration of the substrate to the substrate utilization after the administration of the red pepper diet in men . It has been shown that α 1 – receptors are also mediators of epinephrine and nonepinephrine stimulation of glycogenolysis in the adipocytes and in the liver , however , the detailed mechanisms of these actions remain clarify . From this overview , it can be concluded that why the abdominal fat percentage in the present study were depressed in broiler chicks fed either hot pepper or fenugreek diets .

Table (6) indicate that the T4 and T5 had significantly ($P < 0.01$) lower serum calcium levels (12.95 and 12.16 mg / 100 ml) comparing with other treatments . Serum phosphorus level also was lower with the increasing fenugreek at T5 (7.58 mg/ 100 ml) .

Table (6) : The effects of hot pepper and fenugreek mixing on blood parameters means + standard error for broiler chicks.

Treatment Parameter	T1	T2	T3	T4	T5
Total protein (g / dl)	3.03 + 0.006	3.05 +0.005	3.49 + 0.53	3.07 + 0.14	2.93 + 0.76
Albumin (g / dl)	1.73 + 0.003	2.03 + 0.14	1.85 + 0.26	1.85 + 0.21	2.03 + 0.19
Cholesterol (mg / dl)	126 ^c + 1.15	82.0 ^b + 2.39	83.67 ^b + 1.96	82.67 ^b + 1.32	46.33 ^a + 2.52
Glucose (mg / dl)	251.33 ^b + 7.77	211.33 ^{ab} + 4.51	220.0 ^{ab} + 4.58	189.0 ^a + 5.79	174.67 ^a + 3.37
Triglycerides (mg / dl)	64.44 ^a + 5.49	50.67 ^{ab} + 1.12	53.39 ^{ab} + 1.46	50.73 ^{ab} + 4.71	46.56 ^b + 3.33
Lipid (mg / dl)	682.0 ^a + 8.89	446.33 ^b + 1.79	454.0 ^b + 5.56	434.0 ^b + 6.69	478.33 ^b + 1.18
G O T (U/l)	67.77 ^a + 2.14	73.37 ^{ab} + 1.06	75.83 ^{ab} + 1.95	82.0 ^b + 5.29	84.87 ^b + 3.01
G P T (U/l)	8.95 + 0.39	9.12 + 2.27	8.9 + 1.05	9.22 + 0.68	8.7 +
Calcium (mg / dl)	15.85 ^b + 0.4	15.9 ^b + 0.79	16.06 ^b + 0.78	12.95 ^a + 0.91	12.16 ^a + 0.3
Phosphorus (mg / dl)	8.17 + 1.44	8.19 + 0.91	7.77 + 1.8	8.07 + 2.4	7.58 + 1.28

A , b , c =Means on the same row differently superscripted are significantly different ($P < 0.05$).

There were no differences were observed among treatments in GPT . However , there were significant ($P < 0.01$) increased in GOT between the chicks fed 1.5 % fenugreek and 0.5 % hot pepper 84.88 μ / ml . GOT increase linearly with increasing fenugreek percent with hot pepper . Nakhla , *et . al .* (1991) reported that GOT activity was elevated by fenugreek crude seed saponins diets for broiler chicks . Muralidhara , *et . al .* (1999) indicated that fenugreek had significant acute effect on levels of GOT and GPT .

This research shows that adding hot pepper was satisfy with low to broiler .

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تأثير الشطة و- أو الحلبة في علف كناكيت اللحم على الانتاج ، وصفات الذبيحة ، وتركيب الدم

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في هذا العمل تم بحث تأثير إضافة مخلوط من الشطة والحلبة على دجاج اللحم . تم استخدام عدد 150 طائر غير مجنس عمر سبعة أيام من نوع . وتم توزيعهم عشوائيا على خمس معاملات بكل معاملة ثلاثون طائر موزعة على ثلاث مكررات بكل مكررة عشر طيور . تم تغذية الطيور على عليقة بادية تحتوي على 23 % بروتين ونهاى 21 % بروتين . وكان تركيب المعاملات الغذائية كالتالى : 1 - العليقة الكنترول

2 - عليقة تحتوي على 2 % شطة

3 - عليقة تحتوي على 1,5 % شطة ، 0,5 % حلبة

4 - عليقة تحتوي على 1 % ، 1 % حلبة

5 - عليقة تحتوي على 0,5 % شطة ، 1,5 % حلبة

أوضحت النتائج أن إضافة 2 % شطة أعطت أفضل وزن للجسم وأفضل زيادة وزنية مقارنة بباقي المعاملات . لم يكن هناك أى تأثيرات معنوية على صفات الذبيحة الا فيما يختص بوزن الكبد حيث زاد باضافة 2 % شطة الى العليقة . كما حدث انخفاض معنوي فى نسبة الدهن بالاحشاء وكذلك مستوى الدهون فى الدم والكوليسترول والجلسريد الثلاثى ونسبة الكالسيوم بينما لم يكن هناك أى تأثير معنوي على كل من البروتين الكلى والايوسمين ،GPT

وتفسر فى سيرم الدم

كما أشارت النتائج الى انخفاض الدهن بشدة فى حالة استخدام الشطة والحلبة .

ولذلك فاننا نقرح اضافة 2 % شطة الى عليقة منخفضة الطاقة 2800