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Effect of Dietary Supplementation of Flavomycin on the Growth Performance, Digestibility Traits, Carcass Characteristics, Carcass Meat Chemical Analysis and Some Blood Components of Lambs

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Abstract: The aim of this study was to determine the effects of flavomycin added to the diets on growth performance, digestibility traits, carcass characteristics, carcass meat chemical analysis and some blood components of lambs. Thirty lambs at six months –old were randomly allocated to five groups, with six in each. The dietary treatments were: 1. Basal diet (control); 2. Basal diet + 25 mg flavomycin/kg diet; 3. Basal diet + 50 mg flavomycin/kg diet, 4. Basal diet + 75 mg flavomycin/kg diet and 5. Basal diet + 100 mg flavomycin/kg diet. Body weight gain, feed consumption and feed conversion were determined weekly. Carcass and carcass chemical analysis were determined at the end of the study. There were significant effects of dietary treatments on body weight gain and feed conversion during the experimental period. The addition of flavomycin to the diet was resulted a significant higher body weight gains, better-feed efficiency and improved digestibility traits as compared to that of control group. Also, the supplementation of diet with flavomycin was increased tail fat weight and abdominal fat weight. It was found that carcass weight, carcass yield and dressing percentage were significantly affected by flavomycin additions. It was concluded that the addition of flavomycin improved growth performance, digestibility traits and carcass characteristics of lambs.

Key words: flavomycin, antibiotic growth promoter, lambs, performance, carcass characteristics,

INTRODUCTION

Throughout the world antibiotics have been used extensively as growth promoters in animal feeds for a large number of years. Flavomycin is an antibiotic that promotes growth in ruminant and non-ruminant livestock. Flavomycin is a trade name of the antibiotic growth promoter "Flavophosholipol" It is a gluco–lipid containing phosphorous. According to Bauer and Dost (1974). Flavomycin is unrelated to any of traditional antibiotics and is the first representative of a new group of drugs which has an effect on numerous grams –positive and many grams, negative bacteria that found in the digestive tract. Flavomycin is used as feed additive to promote the growth in ruminant (El-Basiony, 1994), no residues are left in the meat since they are not absorbed from the alimentary tract due to their high molecular size (Hudd, 1983). In lambs, antibiotic improves weight gain and Feed conversion ratio and depressed the dry matter intake (Martini *et al*., 1996, Swanson *et al*., 2000 and Heydari *et al*., 2008). The antibiotic can improve cellulose digestion of diets high in readily available carbohydrate by inhibition the growth of lactate- producing bacteria (Russell and Stroble, 1989 & Matabudul *et al*., 2001). The aim of this study was to determine the effects of flavomycin added to the diets on growth performance, digestibility traits, carcass characteristics and carcass chemical analysis of lambs

MATERIALS AND METHODS

The present work was performed to study the effect of flavomycin supplementation on the performance, digestibility traits, carcass characteristics, carcass meat chemical analysis and some blood components growing lambs. A total number of thirty weaned commercial lambs were randomly distributed into five treatment groups of 6 lambs per each. Lamb s in all treatments were equal in number and had nearly similar initial body weight. The first group was fed the basal diet as control (0.0 supplementation), while the other four groups were fed the basal diets supplemented with 25 mg flavomycin / kg diet, 50 mg flavomycin / kg diet, 75 mg flavomycin / kg diet and 100 mg flavomycin/ kg diet, respectively. Animals were individually weighted at two successive days at the beginning of the experiment and then at 15 days intervals up to the end of experiment. The daily feed and water consumption were recorded and the feed conversion was estimated.

Lambs were housed in semi- open sheds all over the experimental period. All groups were fed ad libitum on a concentrate (as mixture basal diet as shown in Table 1). Rectal temperature and respiration rate were measured three times at 8.00,12.00 and 16.00 h. for one day every week, during the experimental periods. Rectal temperature was measured by inserting YSI Electronic Thermometer Model 46. Respiration rate (RR) was counted by the consistent flank movements per one minute. All measurements were taken within a range of time that did not exceed 2-3 minutes for each animal.

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Table 1: Ingredients of kids diets, chemical composition% and feeding value.

Ingredients	%	Chemical composition %	%	Feed Value	%
Corn	83.00	Dry Matter	90.38	TDN	55.5
Soya bean meal	15.00	Crude Protein	16.15	SV	34.3
Calcium carbonate	1.4			DCP	11.94
Sodium chloride	0.5				
Minerals and vitamins	0.1				

At the end of experimental period, blood was collected from the marginal ear vein after shaving and cleaning with alcohol in less than 2 minutes into dry clean centrifuge tubes for blood biochemical analysis. Blood samples were separated by centrifugation at 3000 rpm for 20 minutes and kept in a deep freezer at -20oC until analysis. Total proteins, albumin, total lipid, cholesterol, AST and ALT, concentrations were estimated using commercial lambs according to the procedure outlined by the manufacturer. Globulin values were obtained by subtracting the values of albumin from the corresponding values of total proteins. Five lambs in each group were slaughtered for studying carcass traits and chemical analysis of carcass meat . Before slaughter the lambs were fasted for 12 hours . The dressing percentage was calculated as (hot carcass weight, liver, heart and kidneys) relatively to slaughter body weight. Data obtained were statistically analyzed by using completely randomize design according to Snedecor and Cochran (1982) by the following model: $Xij = \mu + Ti + eij$ where, μ = general mean, Ti= fixed effect of the treatments(1,…..,5) and eij = random error . The differences between experimental groups were separated by Duncan s multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

The present study was undertaken to investigate the effects of flavomycin added to the diets on growth performance, digestibility traits, carcass characteristics, carcass meat chemical analysis and some blood components of lambs

Growth Performance:

The average daily feed intake, feed conversion, final body weight and daily body gain (Tables 2 & 3) were increased ($p<0.01$) significantly, while water intake insignificantly affected by addition flavomycin to lamb diets when compared with the control group. In Feed intake and conversion the same trend was observed by Bedo (1985); Schrijver *et al*., (1990); Hassan (2009), Aitchison *et al*., (1988) and (1989) , who found that the feed conversion improved by addition flavomycin to lamb diets . Also, the increase in body weight and body weight gain agree with the Aitchison *et al*., (1988) and (1989); Schrijver *et al*., (1990); Korniewicz et al., (1985) El –Basiony *et al*., (2003) and Hassan, (2009) who reported that flavomycin additions increased the final body weight and body weight gain of lambs. Improving the feed conversion , feed intake, live body weight and body daily gain may be due to good effect of flavomycin on lambs health and improving cellulose digestion of diets high in readily available carbohydrate by inhibition the growth of lactate- producing bacteria (Russell and Stroble, 1989 & Matabudul *et al*., 2001). Fermentation balance requires that an increase in propionate production must be accompanied by a decrease in methane production (Surber and Bowman, 1998). Up to 12% of the gross energy of feeds can be lost as eructated methane. Diverting hydrogen to other end products captures more digestible energy from fermented OM, resulting in more efficient use of feed energy. It also lessens the contribution of ruminants to atmospheric methane accumulation (McGuffey al., 2001). Similarly as (Raun, 1990) explained feed conversion (feed to gain ratio) improves when antibiotic is added to the diet because of a more efficient ruminal fermentation, resulting from an increased proportion of propionate to acetate in the rumen, a concomitant depression in CH production and 4 an inhibition of degradation of dietary protein in the rumen.

Table 2: Effect of Flavomycin supplementation on growth performance of growing lambs (x'± SE).

Items	Control	Flavomycin /kg diet				Sig.
		25 mg	50 mg	75mg	100 mg	
Growth performance						
Initial body weight	10.6±0.70	11.3±0.79	11.9±1.01	12.1±0.27	12.6±0.91	N.S
Final body weight	34.9±1.14 ^{e}	46.8±2.13 ^{c}	50.0±0.99 ^{c}	56.4±1.35 ^{b}	60.9±1.85 ^{a}	**
Body weight gain	24.3±1.2 ^{c}	35.5±2.5 ^{b}	38.1±1.7 ^{b}	44.3±0.63 ^{a}	48.3±1.07 ^{a}	**

N S = not significant and **($p< 0.01$) . Means a, b and c in the same row bearing different letters , differ significantly ($p< 0.05$).

Digestibility Traits:

The dry matter, organic matter, crude protein and crude fiber digestibility (Tables 3) were increased ($p<0.01$) significantly by addition flavomycin to lamb diets when compared with the control group. Similar results were obtained by Hassan, **(2009)** who reported that flavomycin additions increased the all digestibility traits of lambs. However, El-Basiony *et al*., (2003), found that using some growth promoters of sheep had no effect on the digestibility traits. Improving the digestibility traits by using flavomycin may be due to the

positive effects on diseases bacteria activity in the rumen. Also, improvement in protein digestibility may be due to the stimulation of rumen proteolytic bacteria (Williams, 1989), while improving crude fiber digestibility may be attributed to increasing the number of rumen cellulolytic bacteria due to flavomycin supplementation (Williams,1989 and Gomex –Iarcon and Hubber 1990).

Table 3: Effect of Flavomycin supplementation on feed intake, conversion, water intake and some digestibility traits of growing lambs (x'± SE).

Items	Control	Flavomycin				Sig.
		25 mg/kg diet	50 mg/kg diet	75mg/kg diet	100 mg/kg diet	
Feed intake	907.8±53.0 ^{c}	1202.2±73.2 ^{b}	1246.7±26.9 ^{b}	1345.6±37.7 ^{ab}	1444.3±54.1 ^{a}	**
Feed conversion	6.7±0.11 ^{a}	6.2±0.12 ^{b}	5.9±0.17 ^{bc}	5.6±0.14 ^{cd}	5.4±0.09 ^{d}	**
Water intake	900.8±60.4 ^{c}	1012.0±50.6 ^{cb}	1108.3±38.6 ^{ba}	1179.9±57.4 ^{a}	1179.8±47.1 ^{a}	N .S
Digestibility traits						
DM	63.3±1.5 ^{c}	67.7±0.33 ^{b}	69.0±1.2 $^{a\ b}$	71.0±1.5 $^{a\ b}$	72.0±1.2 ^{a}	**
OM	63.0±1.2 ^{c}	68.7±0.88 ^{b}	73.7±1.2 ^{a}	75.6±1.4 ^{a}	75.3±2.0 ^{a}	**
CP	70.3±0.89 ^{b}	74.0±1.0 $^{a\ b}$	75.7±1.2 ^{a}	76.3±1.8 ^{a}	77.6±0.88 ^{a}	**
CF	32.1±1.2 ^{b}	35.2±0.39 ^{b}	35.0±1.5 ^{b}	35.3±1.4 ^{b}	39.3±0.89 ^{a}	**

N S = not significant, * (p< 0.05) and **(p< 0.01) . Means a, b and c in the same row bearing different letters , differ significantly (p< 0.05).

Carcass Traits:

Data presented in (Table 4) showed the effect of flavomycin additives on lambs carcass characteristics. Results obtained indicated significantly (p<0.05, 0.01) differences among different groups in dressing %, carcass length, round leg, tail weight, lung and heat weight, liver+ kidney+ spleen weight, neck weight %, shoulder weight %, back and lion weight %, ribs weight %, hind leg weight %, and kidney fat weight of local crossbred male lambs .However, the lambs of experimental groups showed insignificantly differ in skin weight % when compared with the control one. This result may point out to the positive influence of flavomycin in improving feed intake , feed conversion, digestibility of feed nutrients and its active role in improving the lambs health. Similar results were reported by EL-Bassiony *et al*., 2003 and Andrzej *et al*., (2004), who found that offals of the animals calves showed similar values indifferent groups, irrespective of treatments and /or animals live body weight when use male buffalo calves. Also, Hassan, **(2009)** who reported that flavomycin additions improved the carcass and non carcass traits of lambs.

Table 4: Effect of Flavomycin supplementation on some carcass traits of growing lambs (x'±SE).

Items	Control	Flavomycin				Sig.
		25 mg/kg diet	50 mg/kg diet	75mg/kg diet	100 mg/kg diet	
Dressing %	47.5±0.95 ^{b}	49.6±0.74 ^{b}	50.6±0.72 ^{ab}	51.6±1.1 ^{ab}	52.6±0.78 ^{a}	*
Carcass length (cm)	64.7±1.8 ^{d}	67.0±1.7 ^{cd}	72.1±1.4 ^{bc}	75.7±2.1 ^{ab}	80.3±1.5 ^{a}	**
Round leg (cm)	21.3±1.5 ^{b}	24.8±1.8 ^{ab}	25.8±1.3 ^{ab}	27.0±1.4 ^{a}	28.4±1.1 ^{a}	*
Tail weight (kg)	1.13±0.15 ^{d}	1.3±0.21 ^{cd}	1.8±0.14 ^{c}	2.3±0.18 ^{b}	2.8±0.12 ^{a}	**
Liver+ kidney+ spleen (kg)	0.93±0.15 ^{d}	1.4±0.20 ^{cd}	1.6±0.18 ^{bc}	1.9±0.2 ^{b}	2.4±0.12 ^{a}	**
Kidney fat (g)	64.7±3.2 ^{e}	79.3±4.6 ^{d}	92.7±4.4 ^{c}	97.1±3.2 ^{bc}	104.3±2.7 ^{a}	**
Skin %	23.0±1.7	22.0±1.8	24.0±1.7	24.7±2.6	27.0±1.5	N .S
Nek %	4.1±0.41 ^{c}	5.2±0.27 ^{b}	6.0±0.15 ^{a}	6.5±0.23 ^{a}	6.9±0.23 ^{a}	*
Shoulder %	13.2±0.46 ^{c}	13.9±0.52 ^{c}	15.8±0.49 ^{b}	17.4±0.29 ^{a}	18.3±0.37 ^{a}	**
Back &lion %	12.8±0.64 ^{c}	12.9±0.61 ^{c}	14.2±0.23 ^{bc}	15.1±0.32 ^{b}	16.9±0.58 ^{a}	**
Ribs %	16.3±0.88 ^{c}	17.3±0.33 ^{c}	18.7±1.5 ^{bc}	21.3±0.80 ^{ab}	23.3±1.2 ^{a}	**
Hind leg %	24.7±1.2 ^{c}	27.3±1.2 ^{bc}	28.3±1.3 ^{bc}	30.7±1.3 ^{ab}	34.0±2.1 ^{a}	**
Lung and heat (kg)	1.5±0.12 ^{c}	2.0±0.15 ^{bc}	2.3±0.18 ^{ab}	2.6±0.17 ^{a}	2.7±0.17 ^{a}	*

N S = not significant, * (p< 0.05) and **(p< 0.01) . Means a, b and c in the same row bearing different letters , differ significantly (p< 0.05).

Meat Chemical Composition:

Data presented in (Table 5) showed the effect of flavomycin on chemical composition of lambs meat. Data obtained pointed out to significant differences (p<0.01) among different experimental animals in moisture content. However, the control groups showed higher (p<0.01) moisture content. Meat moisture content of the lambs aged 12-13 months represents almost 60 % on the average. It is interested to note that different feed additives didn't effect on lean tissues moisture content. This result may suggest that moisture content of lean tissues had a consistent weight and was not influenced by the different feed additives included in the ration. Such moisture percentage is mainly related to animals age, rations composition, type of feed ingredients and the genetic constituent of the animals itself. Utilization of different growth promoters may probably have indirect effect with tissues chemical composition but its effect coming through physiological roles on ruminal activity. Concerning CP %, data obtained pointed out to significant differences among different experimental groups. However, the control groups still

maintained lower ($p<0.01$) CP % value .i.e. 18.0 %, with significant differences with different treated groups. Although, percentage of CP content in lean tissues of different treated animals represent 18% on the average in male lambs aged (12-13) months and an average 60 kg live body weight with 52 % dressing percentage and 25 kg hot carcass weight. Ether extract of lean tissues, indicated significant differences among different experimental groups. Ash contents of meat showed insignificant differences among different experimental groups. The same trend was observed by Hassan, **(2009)** who reported that flavomycin additions increased the cp % and fat % , but decreased the moisture % of lambs meat. He not agreement with this study in ash.

Table 5: Effect of Flavomycin supplementation on carcass meat chemical analysis of growing lambs (x'±SE).

Items	Control	Flavomycin				Sig.
		25 mg/kg diet	50 mg/kg diet	75mg/kg diet	100 mg/kg diet	
Moisture %	78.9±0.47 ^{a}	78.5±0.32 ^{ab}	77.3±0.25 ^{bc}	76.5±0.25 ^{c}	76.0±0.55 ^{c}	**
Protein %	18.0±0.58 ^{c}	19.0±0.23 ^{bc}	19.6±0.18 ^{ab}	20.1±0.12 ^{ab}	20.7±0.42 ^{a}	**
Fat %	1.3±0.01 ^{c}	1.3±0.02 ^{c}	1.4±0.04 ^{b}	1.5±0.02 ^{ab}	1.6±0.03 ^{a}	**
Ash %	1.03±0.01	1.06±0.02	1.04±0.06	1.05±0.09	1.30±0.25	N.S

N S = not significant, * ($p< 0.05$) and **($p< 0.01$) . Means a, b and c in the same row bearing different letters , differ significantly ($p< 0.05$).

Some Blood Serum Components:

Data presented in (Table 6) showed the effect of flavomycin on some blood serum composition of lambs. Average values of serum total protein, albumin and globulin were significantly ($p<0.05$) increased with addition flavomycin to lamb diets . Similar results were obtained by El-Ashry et al.,(2003), who found that supplemented flavomycin increased ($P<0.01$) total serum protein more than the control. The main function of albumin in blood is to act as a buffer and assist in ion transport and in particular, those of water insoluble vitamins and co –factors (Erwin, *et al*., 1961) Albumin concentration in serum blood of experimental groups (Table6) indicated significant increased ($P \leq 0.05$). As shown, higher albumin values were assessed in serum blood of lambs treated with flavomycin 100 mg / kg diet. Similar results were obtained by El-Ashry *et al*., (2003), who pointed out to higher albumin concentration when flavomycin was supplemented to ration of sheep. As for liver enzymes AST and ALT in (units/l), data obtained in (Table 6) indicated insignificant differences among different experimental groups and both values were within the normal ranges reported by numerous outhers indicating negative influences of different levels of feed additives on both the two liver enzymes . Such results may suggest that Flavomycin didn't have any positive indifferences on enhancing lambs performances (Table 6). Data concerning AST and ALT may also pointed out to the healthy moderate self- excitation to the liver for excretion of trnasaminase liver enzymes for better metabolism. The present results, were in line with those reported by El-Ashry *et al*., (2001), Ibrahim *et al*., (2002) and El-Shaer (2003),concerning rations supplemented with flavomycin added to buffalo and sheep rations, which showed insignificant effect on liver enzymes. Hafez *et al*., (1983) and Abdel-Hamid *et al*., (1999), stated that Got and GPT secretions are accelerators to the rate of metabolism and protein biosynthesis in order to meet the increased requirements to synthesis new tissues. Data in (Table 6) indicated that both of total lipids and cholesterol concentration were not significantly affected by addition of flavomycin. However, El-Ashry *et al*., 2003, found that total lipids were increased ($p<0.05$), by adding of flavomycin more than the control. Similarly, Lather, (1975) and Abd El-Baki *et al*., (1992), showed that level of was not significantly affected by treatments (Flavomycin).

Table 6: Effect of Flavomycin supplementation on some blood components of growing lambs (x'±SE).

Items	Control	Flavomycin				Sig.
		25 mg/kg diet	50 mg/kg diet	75mg/kg diet	100 mg/kg diet	
Total protein (g/L)	6.24±0.22 ^{b}	7.67±0.15 ^{a}	8.07±0.18 ^{a}	8.30±0.08 ^{a}	8.54±0.12 ^{a}	*
Albumin (g/L)	3.27±0.07 ^{b}	4.00±0.01 ^{ab}	4.10±0.23 ^{a}	4.30±0.42 ^{a}	4.47±0.20 ^{a}	*
Globulin (g/L)	2.97±0.22 ^{b}	3.67±0.06 ^{a}	3.97±0.07 ^{a}	4.00±0.34 ^{a}	4.07±0.22 ^{a}	*
Total lipids (g/L)	5.3±0.15	5.4±0.23	5.6±0.19	5.6±0.18	5.4±0.15	NS
Cholesterol (mg%)	199.0±2.3	195.7±6.0	198.0±4.6	195.3±2.6	200.0±1.03	NS
AST (un/L)	70.13±0.59	69.77±0.52	70.33±1.2	69.37±1.23	69.73±0.43	NS
ALT (un/L)	44.47±0.35	43.87±1.45	44.27±0.64	44.0±1.15	44.3±1.35	NS

N S = not significant, * ($p< 0.05$) and **($p< 0.01$) . Means a, b and c in the same row bearing different letters , differ significantly ($p< 0.05$).

Conclusion:

These results are shown that by using flavomycin as an additive can improve lambs performance. These benefits have a direct effect on protecting the lambs internal environment due to increase feed utilization and improving the animal health. Thus, it is recommended that, using flavomycin as an additive would be useful for fattening lambs.

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