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Response of Broiler Chicks to a High Olive Pulp Diet Supplemented with Two Antibiotics

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ABSTRACT

A total of 210 twenty two- day-old broiler chicks were used in this programme to investigale the performance, *[ca* intake, digestibility and visceral organ mass of broiler chicks fed with high level of olive pulp.supplemented with two antibiotics: streptomycin and tylosin. The two antibiotics were added to supply 150 nig/kg of the active ingredient. Chicks which consumed the medicated diets had more ($p<0.05$) gain compared to chicks which consumed the basal diet. However, streptomycin caused more ($p<0.05$) gain compared to tylosin. Antibiotics had no effect on feed intake. The chicks that consumed the antibiotics had heavier ($p<0.05$) weights of edible, inedible organs and small intestine but lower weights of large intestine and cecum. The digestibility of dry matter,'crude protein and nitrogen free extract increased ($p<0.05$) in chicks fed with the medicated diets compared to the chicks fed with the basal diet. It is concluded that antibiotic supplementation had a positive effect on chick's performance and digestibility.

KEYWORDS: antibiotics; olive pulp; chicks; performance; digestibility; visceral organs

I. INTRODUCTION

One of the major obstacles in poultry farms is the high price of feed stuff, where feed constitutes about 75% of the total cost in poultry industry. Maize is the major energy constituent in broiler diets. It is imported at a high price and its price increases every year.

Olive pulp, a remainder of olive cake (the raw material resulting from extraction of olive oil) after removal of the seed fraction is widely available in Palestine. About 40000 tons of the raw material are produced each year (Abo Omar and Gavoret, 1995). Small portion of this amount is used as fuel in heating rural households while the rest is discarded causing pollution hazards.

Several research studies were conducted to investigate the feasibility of utilizing olive pulp in broiler rations. The proportion of olive pulp in its rations is variable. There seems to be a limit between 50 and 100g/ kg (Abo Omar, 2000; Rabayaa et al., 2000). Higher portions cause lower digestibility, less weight gain and poor broiler general performance

Efforts to improve the performance of broilers raised on a high fibre diet via supplementation with sand and molasses were not successful (Onifade and, Babatunde, 1997). However, supplementation of antibiotics caused an improvement of broiler performance (DaTwang et al, 1987 and Onifade and Babatunde, 1997).)

The objective of this study is to evaluate the effects of antibiotics on the performance, digestibility and visceral organs of broiler chicks fed with high level of olive pulp.

2. Materials and Methods

2.1 Diets

The diets used in this study are shown in Table I. Diet 1 is a basal diet that included olive pulp *pi* a level of lOOg/kg. Two antibiotics, streptomycin (as streptomycin sulphate) and tylosin (as tylosin 20) were incorporated into the control diet to supply the active ingredient at the rate of I50mg/kg. Diets were formulated to meet the NRC (1994) chicken requirements.

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2.2 Birds

A total of 210 unsexed 22-day-old chicks of Hubbard strain were purchased from a local hatchery and divided into three groups of 70 chicks each. Each group was partitioned into seven replicates with 10 chicks in-each. Before starting the feeding trial, chicks were fed with a commercial starter diet. Chicks were raised in floor pens. Water was provided with *ad libitum.* Feed consumption and weight gain were recorded on weekly basis until the termination of the experiment when birds were 35 days old. At the end of the feeding trial (day 35), four chicks were taken randomly from each,replicate. Chicks were slaughtered according to the- routine practices adopted in commercial broiler slaughterhouse. Weights of visceral organs, (including liver and heart) were recorded as percent of live body weight.

Weights of total digestive tract and segments (esophagus, provintriculus, gizzard, liver, small intestine, cecum and large intestine) were also recorded.

2.3 Digestion Trial

A total of 18 birds at 28 days of age were used in the digestion trial. The birds were taken randomly from the three treatments (the basal and the two experimental groups). After the birds were isolated from the original flock, they were placed in an individual cage supplied with automatic feeders and drinkers.

Birds were kept in their cages for 3 days for the purpose of adaptation to the new environment. This period was followed by a 6-day total collection period. Samples from each ration were collected and stored for later analysis. During the collection period, feed intake, fecal output and feed refused were weighed and sampled for later analysis. Both feed and feces samples were analyzed for dry matter (DM), crude protein, crude fat, and crude fiber according to (AOAC, 1984).

2.4 Chemical Analysis

Feed samples were analyzed for proximate composition (AOAC, 1984) and detergent fibre using the procedures of Goering and Van Soest (1970).

2.5 Statistical Analysis

All data were analysed using Steel and Tome (1980) procedures. The Duncan Multiple Range Test (Duncan, 1955) was used to separate treatments' means.

3. Results and Discussion

3.1 Composition of Olive Pulp

The composition of olive pulp is shown in Table (2). The values of nutrients determined by the chemical analysis are consistent with those reported by other researchers (Rabayaa, 2000, Abo Omar, 2000).

3.2 Body Weight

The results observed are consistent with those reported by other workers when broilers were fed with high fiber diets (Kamel et al., 1981; EI Moghazy and El Boushy, 1982b). However, the addition of the two antibiotics improved (PO.05) weight gain in broilers (Table 3). Streptomycin had more ($P<0.05$) effect on broilers growth compared to tylosin. This finding is consistent with previous reports on growth promoting activity of antibiotics in non- ruminant diets (Jefferies et al., 1977; Dafwang et al., 1987; Yen and Nienaber, 1992; Onifade and Babatunde, 1997).

3.3 Feed Intake

The experiment showed that there were no significant differences among the experimental groups in reghrd to feed intake (Table 3). It seemed that antibiotics had no effect to improve appetite of the rations which contained the high levels of fibre. Previous reports showed that the high levels of fibre caused a decrease in intake due to a decrease in appetite (EI Moghazy and El Boushy (1982b). However, Onifade and Pabatunde (1997) reported that antibiotics had different effects on broiler intake when fed whith high fibre rations a result which is not consistent with our findings. .«

3.4 Visceral Organ Mass

The supplementation of antibiotics had an influence on visceral organ mass of broiler chicks. Chicks consuming olive pulp with streptomycin and tylosin had the heaviest weights ($p< 0.05$) of the edible organs: liver, heart and gizzard compared with the chicks that consumed the basal ration.

Weights of these parts in chicks fed with the basal ration were similar to weights reported when broilers were fed with diets high in fibre in replacement of maize (Kamel et al., 1981). However, the addition of antibiotics caused an increase in the edible organ weights through affecting the physiology of these organs.

In addition, the addition of antibiotics had similar effect on weights of inedible organs: esophagus, crop, lungs, proventriculus, trachea (Table 4).

The chicks that consumed streptomycin and tylosin had higher ($p < 0.05$) weights of small intestine as compared to the basal group which had similar weights when olive cake diets were fed to broiler chicks and in rats receiving a high fibre diet (Dunaif and Sheeman, 1981).

The highest weight of large intestine was in the chicks that consumed the basal ration. A similar trend was observed for weights of cecum, where the control chicks had the highest cecum weights. On the other hand, high fibre levels when fed to pigs increased the colon and rectum weights (Pekas et al., 1983).

3.5 Digestion Trial

3.5.1 Digestibility of Dry Matter

The digestibility of dry matter ranged from 69% to 71% (Table 5). The broiler chicks that consumed the antibiotics had the highest dry matter digestibility (70 and 71%), compared to the dry matter digestibility of the control chicks (69%). The digestibility of diy matter might be enhanced by the addition of antibiotics. Similarly, apparent retention of dry matter was reported by Onifade and Babalunde (1997) when high level of fiber was fed to broiler chicks from 7 **to** 35 days of age.

3.5.2 Crude Protein Digestibility

Antibiotics caused an increase ($p<0.05$) **in** crude protein digestibility (Table 5). The digestibilities ranged between 73 and 79%. These digestibility levels are higher than the levels that were reported by a previous study on broilers fed with high levels of fibre (Onifade and Babatunde, 1997).

3.5.3 Fiber Digestibility

The digestibility of crude fibre was not affected significantly by the addition of antibiotics (Table 5). However, the digestibility of crude fibre was higher in diets with the highest level of olive pulp. The avarage digestibilities were 29.0, 30.0 and 30.0% for the control, streptomycin and tylosin, respectively. High fiber digestibility levels were observed by Onifade and Babatunde (1997).

The lower digestibility of fiber is explained by the inability of chicks' digestive enzymes to deal with fiber and its fractions which can be improved significantly by the addition of antibiotics to broiler rations (Onifade and Babatunde, 1997).

3.5.4 Nitrogen Free Extract Digestibility

As shown in Table (5), the digestibility of nitrogen free extract (NFE) ranged from 80 to 84%. Rations with streptomycin had the highest ($p<0.05$) NFE digestibility (84%) followed by rations with tylosin (83%) compared with the control diet which had 80% NFE digestibility. Similar results were reported when high fiber diets fed to broilers (Onifade and Babalunde, 1997).

In conclusion, the general performance, feed efficiency, apparent digestibility of protein and nitrogen free extract by broiler chicks were improved on antibiotic supplementation of a high fibre diet. Visceral organs were variably affected by the two tested antibiotics.

Table 1
Composition of olive pulp basal diet fed to broiler chickens.

Ingredients	g/kg
Maize	50
Wheat	400
Soya bean meal	300
Dicalcium phosphate	16
Sand	15
Oil	50
Premix	9
Olive pulp	160
Antibiotic	0

Chemical analysis:	
Dry matter	879
Crude protein	196
Crude fiber	61
NFE	503
Crude fat	56
Ash	63
Calcium	10
ME (MJ/kg)	13.3
Phosphorus	5

Table 2
Composition of olive pulp used in the feeding trial (%).

Nutrient	%
Dry matter	87.0
Crude protein	10.2
Crude fiber	24.0
Neutral detergent fiber	26.0
Acid detergent fiber	34.0
Nitrogen free extract (NFE)	23.3
Crude fat	12.0
Calcium	.6
Phosphorus	.1
Ash	7.5

Table 3
Body weight development of broilers in the olive pulp feeding trial (g).

Group	Control	Streptomycin	Tylosin
Weeks			
Initial weight	40.1	39.5	40.5
Weight at 35 days	1685.0 c	1874.0 a	1750.5 b
Weight gain (g per chick per day)	46.9 c	52.4 a	49.0 b
Feed intake (g per chick per day)	88.6	89.9	90.2
Feed: gain ratio	1.88a	. 1.71 b	1.84 a

Means in the same row not followed by the same superscript are significantly different at the level of $p<0.05$.

Tabic 4
Effects of antibiotics on broilers visceral organs and gastrointestinal tract segments (% of live weights)-

Olive pulp level	Gizzard	Liver	Heart	Esophagus	Crop	Lung	Trachea	I'rovinlriculus	Small intestine	Cecum
Basal diet	3.0	2.0	0.6	0.1	0.1	0.6	0.06	0.1	3.6	0.3
Streptomycin	5.0	3.1	0.9	0.17	0.16	0.7	0.08	0.16	2.7	0.24
Tylosin	4.6	2.9	0.8	0.17	0.15	0.7	0.08	0.15	2.8	0.23
P value (ANOVA)	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05

Tabic 5. Digestibility of dry matter and nutrients by broilers in the experiment.

	Control	**Streptomycin**	Tylosin
Dry matter	69.0	70.0	71.0
Crude protein	73.0b	79.0a	78.0a
Crude fiber	29.0	30.0	30.0
NFE	80.0b	84.0a	83.0a

Means in the same row not followed by the same superscripts are significantly different (p<0.05).

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