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Effects of Dietary Furazolidone on Blood, Meat Chemistry and Some Carcass Traits of Broiler Chicks under Sudan Conditions

[1]K.M. Elamin, [2]H.D. Ahmed and [3]K.A. Abdel Ati

[1]Department of Animal Breeding, Faculty of Animal Production, University of Gezira, Sudan
[2]Department of Poultry Production, Ministry of Animal Resources, Khartoum, Sudan
[3]Department of Poultry Production, Faculty of Animal Production, University of Khartoum, Sudan

Corresponding Author: K.M. Elamin, Department of Animal Breeding, Faculty of Animal Production, University of Gezira-Wad-Medani, P.O. 20, Sudan

ABSTRACT

In large poultry farms, especially broiler type, it is a common practice to add antibiotics in the ration as to promote the growth and decrease the mortality rate. This phenomenon is usually observed in developing countries where hygienic measures are poor. The present study was conducted to evaluate the effects of furazolidone on broiler's blood profile meat chemical characteristics and some carcass traits. Furazolidone was added to isonitrogenous and isocaloric four formulated rations at four levels, 0,100, 200, 300 mg kg^{-1} feed. A total of 144 one-day old non sexed chicks of Lohmann breed were used. Experimental chicks were distributed randomly into 4 treatments, each with three replicates (36 birds/treatment and 12 birds/ pen as replicate). Blood traits (phosphorus, calcium, cholesterol and lipids levels), some carcass traits (hot dressing percent, liver weight as percentage, total internal organs and Tibial ash) and meat chemical traits (crude protein, moisture, ether extract and ash) were studied. Furazolidone addition significantly ($p \leq 0.05$) affected blood phosphorus level (2.80-in furazolidone free diet-versus = 4.00-in furazolidone treated diets). Results showed that furazolidone affected hot dressing percent and the addition of 300 furazolidone resulted in the highest percent (73.4±0.003). It clear from obtained results that meat content of crude proteins, moisture, ether extract and ash were significantly affected by the level of Furazolidone added.

Key words: Ash, crude protein, liver, phosphorus

INTRODUCTION

White meat, including chicken meat, is superior to red meat from health point of view because it contains relatively less fat, cholesterol and iron (Jaturasitha *et al*., 2008). Chicken meat is also characterized by being comparatively low in its prize, easy in portioning into many small parts and suffer no religion restriction in its consumption (Jaturashitta, 2004). Thus poultry farming played a major role in filling the gap made by world protein deficiency by increasing meat and egg annually produced (Pervez *et al*., 2011). Mumtaz *et al*. (2000) reported among the numerous types of food man can get from sea and land he still has special preference to animal protein (meat, milk, egg and fish). Local chicken in Sudan are known of its low performance in egg production and meat yield (Desai and Halbrook, 1961; Desai, 1962; Elamin *et al*., 2004; Elamin, 1998; Yousif, 1987). Hence, exotic egg and meat type breeds were introduced to

increase animal protein production to fill the gap between its deficiency and the actual human needs. Feed additives as antibiotics and anti stress are commonly used in broiler feeds to enhance the growth and cure subclinical infections (Olugbemi *et al*., 2004).

Phillips and Hailey (1986) and Brander *et al*. (1985) reported that Furazolidone is a relatively broad spectrum antibacterial drug that is widely used to treat certain bacterial and protozoal diseases in both man and animals. The drug which is a member of nitro-furan group is known to be used as feed additive (bacteriostatic and growth promoter agent) to starter ration of Turkey (Czarnecki, 1990). Mustafa *et al*. (1986) reported that furazolidone in goats lead to changes in some plasma constituents and histopathological changes in the liver and kidneys. In poultry the drug was reported to antagonize the utilization of thiamine (Ali and Bartlet, 1982) and to inhibit the activity of monoaminoxidase (MAO) enzyme (Ali, 1983).

The objectives of this study were to investigate the effects of furazolidone on blood and meat chemistry and some carcass traits in broiler chickens under Sudan conditions.

MATERIALS AND METHODS

Study location: The study was conducted in the premises of the faculty of Animal Production, University of Khartoum. The study lasted for seven weeks during which the highest and lowest temperature and relative humidity were 35-24°C and 50-325%, respectively.

Experimental house: Birds were confined in open sided house, constructed from cemented brick walls, iron posts and the rest of the house was covered with fine wire netting. The house was divided into 12 pens each of a meter square dimension. A clean wood shaving was provided as bedding. Clean feeding and drinking devices were provided and adjusted according to the growth of the chicks.

Experimental diets: Isocaloric and isonitrogenous diet that met (NRC, 1984) recommended levels of nutrients for broiler chicks as in Table 1. This diet was formulated from locally available ingredients (sorghum, groundnut and sesame cake). Furazolidone was added at graded different levels (0, 100, 200 and 300 mg kg^{-1} feed).

Table 1: Composition of the basal diet

Item	Percent
Ingredient	
Sorghum	64.00
Groundnut meal	17.00
Sesame meal	10.00
Wheat bran	2.00
Concentrate	5.00
Oyster shell	1.50
Salt	0.25
Vitamins and minerals	0.25
Determined analysis	
Dry matter	95.05
Crude protein	22.32
Ether extract	3.00
Crude fiber	5.48

Management and data collection: Feed and water were supplied *ad libitum*. Continuous light was provided naturally and artificially. Each bird was leg-banded, weighed individually and slaughtered. They were put in hot water, manually plucked and washed. Evisceration was done by removal of visceral and thoracic organs. Carcasses were then weighed the dressing percentages were calculated in term of the hive weight. Total viscera and liver relative weights were calculated as a percentage of the live weight. Blood samples were taken during slaughtering; sera were separated, collected and stored for later chemical analysis. Carcasses were stored for 24 h in air chilling refrigerator and then dissected into left and right halves. The right side of each carcass was deboned. The tibia bones collected and stored for bone ash determination.

Experimental design and statistical analysis: A complete randomized design was used and obtained data were subjected to statistical analysis according to analysis of variance a procedure outlined by Steel and Torrie (1980). Duncan's multiple range tests was used to determine levels of significance between treatment means at $p \leq 0.05$.

RESULTS AND DISCUSSION

The effects of furazolidone on the blood chemistry were presented in Table 2. The supplementation of the drug did not significantly ($p \leq 0.05$) affected serum level of calcium, cholesterol, or lipids ($p > 0.05$). However, there was a significant increase ($p > 0.05$) in serum level of inorganic phosphorus, as the drug level increased, which is in accordance to Nazifi and Asasi (2001) and Ziaie *et al.* (2011). The control group of chicken had the significantly ($p \leq 0.05$) lowest phosphorus level (2.80 mg dL^{-1}), while the other treatment that consumed Furazolidone in their diet had a range of 4.18-4.62 mg dL^{-1}. This phosphorus blood level is in agreement with Feizi *et al.* (2011). However, Abdel-Fattah *et al.* (2008) and Mehdipour *et al.* (2009) reported higher levels of phosphorus 6.22-6.68 and 5.95-7.93 mg dL^{-1}, respectively. Addition of Furazolidone in the diet had no significant effects ($p \leq 0.05$) on calcium blood level and a range of 10.66-13.53 mg dL^{-1} was recorded, this is in agreement with Feizi *et al.* (2011), Abdel-Fattah *et al.* (2008) and Ziaie *et al.* (2011). However, Mehdipour *et al.* (2009) reported lower values for serum calcium level in broilers (9.10-9.33 mg dL^{-1}).

Cholesterol blood level in this study (198.75- 213.33) were higher than results obtained by Nworgu *et al.* (2007), Murwani *et al.* (2011) and Zomrawi *et al.* (2012) who reported 143-163, 108-144 and 58-128 mg dL^{-1}, respectively. On the other hand, Mohammed (2011) and Abdel-Fattah *et al.* (2008) reported higher values than in the present study (152.48-178.87 and 393-267, respectively).

Table 2: Effects of dietary levels of furazolidone on the blood chemistry of broiler chicks

	Level of furazolidone (mg kg^{-1} feed)				
Traits	0	100	200	300	SE±
Phosphorus (mg dL^{-1})	2.800^{b}	4.620^{a}	4.180^{a}	4.480^{a}	0.380
Calcium (mg dL^{-1})	12.770^{a}	10.660^{a}	13.530^{a}	13.140^{a}	1.010
Cholesterol (mg dL^{-1})	198.750^{a}	202.250^{a}	213.330^{a}	203.750^{a}	14.080
Lipids (g dL^{-1})	0.326^{a}	0.317^{a}	0.388^{a}	0.440^{a}	0.057

Means in the same row with similar letters are not significantly different at 0.05 probability, SE: Standard error of the means

Table 3: Effects of dietary levels of furazolidone on the dressing, liver, total internal organ and tibia ash % of broiler chicks

	Level of furazolidone (mg kg^{-1} feed)				
Traits (%)	0	100	200	300	SE±
Hot dressing	72.20[b]	71.10[d]	71.40[c]	73.40[a]	0.003
Liver	1.84[a]	1.85[a]	1.82[a]	2.10[a]	0.160
Total internal organs	8.69[a]	9.35[a]	8.93[a]	8.88[a]	0.050
Tibia ash	43.75[a]	42.48[a]	44.90[a]	42.39[a]	2.210

Means in the same row with similar letters are not significantly different at 0.05 probability, SE: Standard error of the means

The level of furazolidone incorporation had no significant effects on total blood lipids. Obtained range in this study was 0.317-0440 g dL^{-1}. These values were lower than levels reported by Abdel-Fattah *et al.* (2008). This range is higher than the results reported by Issa and Abo Omar (2012).

The effects of different levels of furazolidone on the dressing, internal organs, liver and tibia ash were shown in Table 3. The results showed that total organs, liver and tibia ash percentage were not affected by the addition of dietary furazolidone at the various levels ($p>0.05$). However, the dressing percentage revealed significant differences ($p>0.05$) in the various treatments but this differences were not consistent and the group fed furazolidone at level of 300 mg kg^{-1} of feed showed the highest value of dressing percentage. The range for dressing% obtained in this result (71.1-73.4%). This result is in accordance to Tekeli *et al.* (2011) who found a range of 73.54-74.72%. However obtained results were higher than the range reported by Abdel-Fattah *et al.* (2008) who reported 66.1-68.66% and Durrani *et al.* (2007) who found (59.08-61.23%). On the other hand, obtained results were lower than those obtained by Zomrawi *et al.* (2012) who found 75.15-76.26%. However, Mohammed (2011) obtained much high results (2.60-3.43%).

Percent of liver weight in this study was 1.82-1.84% and this in accordance to Mehdipour *et al.* (2009) who found 1.91-2.06% but lower than the results reported by Mahmood *et al.* (2007) and who found 2.38-2.46%.

Percent of total internal organs was 8.69-8.93%, however, Mahmood *et al.* (2007) found slightly higher value (9.16%). Obtained range for liver weight% is slightly higher than that reported by Abeke *et al.* (2008) who found 1.70-1.40%.

Percent of tibia ash was 42.30-44.90%, this result is in accordance with Mohammed (2011) and Onyango *et al.* (2003) who found 41.12-45.33% and 42-51% but is slightly lower than the range, 49.82-53.44%, reported by Angel *et al.* (2006).

The effects of furazolidone on meat composition were shown in Table 4. Crude protein content of the muscle was not affected by treatment differences ($p>0.05$). Moisture content in the meat slightly decreased at increasing level of furazolidone (From 73.10 to 72.91). Meat content of ether extract also showed noticeable decrease due to variation in dietary Furazolidone and the control group showed the highest level ether extract (3.90 vs. 2.90- 3.21). On the other hand, ash meat content showed significant increase ($p>0.05$) due to variation in Furazolidone however, this trend was not consistent. Mean values of crude protein, moisture, ether extract and ash percentages were 21.86-21.88, 72.91-73.10, 2.90-3.90, 1.09-1.14%, respectively and these were higher than results for protein and moisture content reported by Holcman *et al.* (2003) who found (20.4, 1 and 72%, respectively). On the other hand, Abaza *et al.* (2008) reported a range of 20.10-21.58, 69.54-71.04,

Table 4: Effects of dietary levels of furazolidone on the meat composition of broiler chicks

	Level of furazolidone (mg kg^{-1} feed)				
Traits (%)	0	100	200	300	SE±
Crude protein	21.88[a]	21.87[a]	21.86[a]	21.88[a]	0.005
Moisture	73.10[a]	73.10[a]	72.97[a,b]	72.91[b]	0.040
Ether extract	3.90[a]	3.21[b]	2.90[b]	2.94[b]	0.130
Ash	1.09[c]	1.13[b]	1.20[a]	1.14[b]	0.009

Means in the same row with similar letters are not significantly different at 0.05 probability, SE: Standard error of the means

2.36-2.55 and 1.21-1.31% for protein, moisture, fat and ash meat content, respectively. These findings were more or less similar to the findings in the present result. Meat traits in this study were generally lower than the results reported by Hardini and Djunaidi (2010) who reported 22.56-20.42. 72.04-75.86, 6.15-4.49 and 3.37-7.15% for the traits, respectively.

CONCLUSION

The addition of the drug to a doze of 300 mg kg^{-1} gave the highest value of dressing percentage and a low fat content of the carcass which may be of a good value in finished product. Birds can tolerate the drug addition up to 300 mg kg^{-1} without causing toxicity or adverse effects. Further studies were suggested to detect the drug residues in different organs and tissues.

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