International Journal of Agriculture, Environment and Bioresearch

Vol. 3, No. 05; 2018

ISSN: 2456-8643

EFFECTS OF (ficus sycomorus) BARK ON BODY WEIGHT, FEED INTAKE AND SELECTED INDICATORS OF LIVER TOXICITY IN BROILERS

Martha Musukwa[2], Felix Haazele[2], Wilson Mwenya[1], Francisco Kanyinji[1], Pharaoh Sianangama[1], Joseph Simbaya[1], Ashley Chishiba[1]

[1]University of Zambia, School of Agricultural Sciences, Department of Animal Science, Box 32379, Lusaka, Zambia.

[2]Martha Musukwa; Department of Animal Science, University of Zambia, School of Agricultural Sciences, Box 32379, Lusaka, Zambia.

ABSTRACT

The aim of this study was to assess and compare the proximate composition of cultured Following the ban on the use of antibiotic growth promoters in poultry there has been increased research in plants having high bioactive compound content. Ficus sycomorus is an edible plant species that has been reported to contain tannins, flavonoids, saponins, steroids and alkaloids which make it a possible alternative to antibiotic growth promoters in broiler production. The incorporation of Ficus sycomorus bark in the feed of broilers could induce hepatotoxic stress because the bark contains tannins and alkaloids. Therefore, the effects of 2, 4, 6, and 8 g/kg of Ficus sycomorus bark powder (FSBP) in broiler feed on Body Weight, Feed Intake, Alanine aminotransferase (ALT) activity levels, Heterophil to Lymphocyte ratio, Serum Total Protein and serum Albumin of Cobb 500 broilers were investigated. The control had no bark added to the feed. The treatment diets were fed up to 42 days of age. After floor-brooding the birds were moved to experimental cages at 21 days of age. The cages were arranged in a Completely Randomised design with nine replicates for each treatment and experimental units having five birds each. There were no indications of liver toxicity effects from the dietary FSBP levels as ALT activity levels and Heterophil to Lymphocyte ratio were not significantly different ($P>0.05$) for all the FSBP levels. Serum Total Protein and serum Albumin at 36 and 43 days of age were positively correlated ($P<0.05$). The Body Weights at 22, 29, 36 and 43 days were positively correlated ($P < 0.05$) to the serum Total Protein and Albumin levels at 36 days indicating increased stimulation of protein synthesis for weight gain and further demonstrating that there were no hepatotoxic effects of the dietary bark levels.

Keywords: Ficus sycomorus bark, broiler, hepatotoxicity, Alanine aminotransferase

1. INTRODUCTION

Following the ban on the use of antibiotic growth promoters in poultry there has been increased research in plants having high bioactive compound content for alternative growth promoters. Bernhoft (2010) defined bioactive compounds in plants as secondary plant metabolites eliciting pharmacological or toxicological effects in humans and animals. Croteau et al. (2000) placed

Vol. 3, No. 05; 2018

ISSN: 2456-8643

bioactive compounds of plants inthree main categories: terpenes and terpenoids, phenolic compounds and alkaloids. Bioactive compounds possess antimicrobial as well as appetite enhancing, digestion stimulating, antioxidant, and anti-inflammatory properties, among others, which enable these plants to biologically function as alternatives to the antibiotic growth promoters.

Ficus sycomorus is an edible plant species that has been reported to contain tannins, flavonoids (phenolic compounds), saponins, steroids (terpenoids), (Sandabe *et al.,* 2006; Hassan, 2007; Adeshina *et al.,* 2009; Saleh and Al-Mariri, 2017), and alkaloids (Adeshina *et al.,* 2009). It has been widely used in traditional medicine in Africa and the Middle East (Lansky and Paavilainen, 2011) and other parts of the world (Saleh et al., 2015). Its medicinal properties may be attributed to the presence and activity of these bioactive compounds, particularly its high phenolic content (Raidandi et al., 2014). Based on this, consideration was made that *Ficus sycomorus* may be a possible alternative to antibiotic growth promoters in broiler production.

Theincorporation of *Ficus sycomorus*bark in the feed of broilers could induce hepatotoxic stress because the bark contains tannins and alkaloids. Tannins have been found to have some hepatotoxic effects in chickens (Ortiz *et al.,* 1994;Kumar *et al.,* 2007). The liver is closely associated with the small intestine where the products of feed digestion and other ingested materials are absorbed. The liver processes absorbed nutrients for storage and regulates release to the systemic circulation. It minimizes exposure of the body to toxins and foreign chemicals through biotransformation and disposition. The central role played by the liver in the clearance and transformation of chemicals exposes it to toxic injury (Singh *et al.,* 2011). The pattern of liver injury caused by hepatotoxic herbs is usually zonal necrosis confined mainly to a particular zone of the liver. It may be accompanied by severe disturbance of liver function leading to acute liver failure (Singh *et al.,* 2011).The incorporation of *Ficus sycomorus* bark into broiler feed, therefore, requires validation of hepatotoxic effects on the birds at dietary levels.

The two major liver enzymes that are usually used as biochemical markers of the injury caused by toxins to liver cells are Alanine aminotransferase (ALT) and Aspartate aminotransferase (AST). However, the activities of ALT outside the liver cells are very low and therefore, ALT is considered a more specific indicator for hepatocellular damage than AST (Burtis *et al.,* 2008). Alanine aminotransferase is regarded as the standard biochemical marker of hepatotoxicity (Singh *et al.,* 2011). The activity of AST is fairly high in tissues such as kidneys, brain, pancreas, lungs, leukocytes, erythrocytes, cardiac and skeletal muscles *(*Kasper *et al.,* 2005, Singh *et al.,* 2011). Benichou (1990) and Andrade *et al*. (2007) reported that when liver injury occurs, serum activity levels of ALT rise three times above the upper limit of normal levels. After severe damage ALT levels can rise up to 50 times higher than normal (Huang *et al.,* 2006). Determining serum albumin levels is considered as a 'test of liver function'. Hepatotoxicity leads to a decrease in albumin production (Thapa and Walia, 2007) due to direct inhibition of synthesis by toxins (Burtis *et al.,* 2008). It has often been used as a supplementary test for hepatic biosynthetic functions (Singh *et al.,* 2011; Ekpenyong *et al.,* 2012; Mordi and Akanji, 2012;

Vol. 3, No. 05; 2018

ISSN: 2456-8643

Elgaml, 2014). Serum total protein determination is often included in the biochemical markers used to confirm hepatotoxic injury (Singh *et al.,* 2011; Ekpenyong *et al.,* 2012; Elgaml, 2014).Most plasma proteins are synthesized in the liver (Hochleithner, 1994). Hepatotoxic injury to liver cells would therefore result in low plasma protein levels due to impaired synthesis and normal plasma protein levels would reflect normal synthesis. The most accepted immunity-related stress indicator in avian species is a rise in the heterophil-to-lymphocyte ratio (Siegel, 1995; Puvadolpirod and Thaxton, 2000abc; Davis *et al.,* 2008). Heterophil numbers increase during mildly or moderately stressful conditions and consequently the heterophil to lymphocyte ratio can be used to detect the presence of physiological stress for most stressors (Maxwell and Robertson, 1998; Davis *et al.,* 2008). This was used as an additional validation indicator of stress due to hepatotoxicity.

Toxicity studies conducted with the use of 0.2 to 12 g/kg aqueous root-bark extract of *Ficus sycomorus* (Linn) in Albino Rats caused a decrease in body weight indicating that the extract had an appetite depressing effect (Garba, 2006). Body weight and feed intake were, therefore, also used in the experiment as indicators of *Ficus sycomorus* bark toxicity.

The objectives of this study were to determine the effects of supplements of *Ficus sycomorus* bark powder in broiler diets onbody weight, feed intake and serum levels of Alanine aminotransferase, total protein, albumin and heterophil: lymphocyte ratio.

2.0 MATERIALS AND METHODS

2.1 Preparation of Ficus sycomorus Bark Powder and Treatment Diets

Fresh *Ficus sycomorus* bark was collected from Lusaka and dried in the shade. After manual sorting to remove fibrous and dry corky material the dry bark was ground in a hammer mill. The ground bark was manually passed through a 1mm sieve and fine ground *Ficus sycomorus* powder was collected for incorporation into broiler feed.The treatment diets were composed of *Ficus sycomorus* Bark Powder (FSBP) at 0.2 (2FSBP), 0.4 (4FSBP), 0.6 (6FSBP) and 0.8 (8FSBP) grams per kilogram of basal starter or finisher feed. The control (0FSBP), had no FSBP added to the feed. The compositions of the basal Starter and basal Finisher are in Table 1.

2.2 Bird Management and Experimental Design

Two hundred and fifty chicks were purchased from Hybrid Poultry Hatchery in Lusaka for the broiler feeding trials of diets containing air dried ground *Ficus sycomorus* bark. The feeding trials were carried out at the University of Zambia Animal Science Field Station. At the Field Station the chicks were randomly divided into five groups of 50 chicks and placed in 2m x 1m deep litter brooding pens to which treatments containing *Ficus sycomorus* Bark Powder (0FSBP, 2FSBP, 4FSBP, 6FSBP and 8FSBP) had earlier been randomly assigned. The chicks were brooded in these groups for 20 days, during which period they were given water with mineral and vitamin supplements and fed on the Starter treatment diets.

Vol. 3, No. 05; 2018

ISSN: 2456-8643

Table 1:Composition of Basal Broiler Starter and Broiler Finisher Diets

Item	Phase Feeding Regime	
	Starter (1 to 28 days)	Finisher (over 28 days)
Feed Ingredients (g/kg)		
No. 3 Meal	513.8	687.2
Mechanical Extracted Soyabean Meal	445.0	280.0
Dicalcium Phosphate	25.0	19.5
Limestone	8.0	7.0
Methionine	1.2	0.3
Salt	3.0	3.0
Broiler Premix	4.0	3.0
Analysed Composition, (g/kg)		
Crude Protein	248.1	191.7
Crude Fat (Ether Extract)	85.1	70.7
Calcium	8.9	7.7
Phosphorus	4.2	3.6
Calculated Composition		
ME (Kcal/kg)	2638.9	2856.7

At 21days of age, the birds were transferred into cages (45cm wide, 80cm long and 50cm high) arranged in a Completely Randomized Design. The five treatments were randomly assigned to the 45 cages in nine replicates for each treatment. Each cage had five birds placed in it to make an experimental unit. The cages were each supplied by a feeder and a two-litre plastic drinker hanging on the outside. The birds were fed on Finisher treatment diets from the 29th to the 42nd day of age.

2.3 Body Weight and Feed Intake Data Collection

Body Weight was measured every first day of the week on the 1st, 8th, 15th, 22nd, 29th, 36th, and 43rd days and feed intake was recorded daily. Body Weight and Total Feed Intake at 43 days of age were used to calculate Feed Conversion Ratio of the birds on different treatments.

2.4 Blood sampling and analysis

2.4.1 White blood cell differential count

Blood was collected weekly, starting at 22 days of age, up to 36 days of age. One bird was randomly selected from each of the nine replicates of each treatment, on the 22nd, 29th, and 36th days of age. A 21 gauge needle and syringe was used to collect 1 ml of blood from the axial vein of the chicken. The blood was put in ethylenediaminetetraacetic acid (EDTA) anticoagulant

Vol. 3, No. 05; 2018

ISSN: 2456-8643

coated test tubes and immediately shaken gently to mix the EDTA with the blood and prevent coagulation. The blood was immediately taken to the University Of Zambia School Of Veterinary Medicine for White Blood Cell Differential count.

The whole blood collected in EDTA containing test tubes was used to make blood smears. This was done by placing a drop of blood on one end of a microscope slide and then using the edge of a second slide the drop of blood was smeared across the surface of the slide. Even distribution of the blood over approximately two thirds of the slide produced a rainbow color pattern representing a 'feathered edge' which indicated the ideal one cell layer for microscopic examination. The blood smears were then stained using Wright's stain. On each sampling day 45 blood stains were made from the blood collected from each pen. The relative proportions of each White Blood Cell type were determined by examining the stained blood smear slides under a light microscope and counting 100 leukocytes, tallying each leukocyte type to give the percentage of each type. The leukocytes were differentiated into basophils, eosinophils, heterophils, lymphocytes and monocytes.

2.4.2 Alanine aminotransferase, serum Total Protein, and serum Albumin determination

One bird was randomly selected and sacrificed at each of 36 and 43 days of age, from each of the nine replicates of the five treatments. The birds were starved for twelve hours before slaughter. The birds were slaughtered by severing the neck. Blood was then collected in plain test tubes without anticoagulant in order to allow clotting. The blood was taken to the School of Veterinary Medicine at the University of Zambia for serum collection and analysis. The 45 serum samples collected after centrifuging the clotted whole blood were used for spectrophotometric determination of levels of Alanine aminotransferase activity, Total protein and Albumin by using a Pharmacia Biotech spectrophotometer according to Burtis *et al.* (2008).

2.5 Statistical Analysis

Analysis of variance (ANOVA) was done in a Completely Randomised Design (CRD) for Total Feed Intake, Body Weight at 22, 29, 36 and 43 days of age;Heterophil:Lymphocyte ratio at 22, 29 and 36 days of age; and Alanine aminotransferase activity, serum Total protein, and serum Albumin levels at 36 and 43 days of age. Genstat Version 16 Statistical software was used for the Analysis of Variance (ANOVA). Least Significant Difference (LSD) was used to separate means that were significantly different from each other according toLittle and Hills (1978) andGomez and Gomez (1984).Treatment effects were considered to be significantly different at $P<0.05$.

3.0 RESULTS AND DISCUSSION

3.1 Body Weight and Feed Intake

Body Weights, Feed Intake and Feed Conversion Ratio (Table 2) at 43 days of age for the birds fed different levels of FSBP showed no significant differences $(P > 0.05)$. However, the 43 day Body weights were positively correlated $(P < 0.05)$ to Total feed intake (Table 3) and were $(P < 0.05)$ negatively correlated to the Feed Conversion ratio (Table 3). The relationships between

Vol. 3, No. 05; 2018

ISSN: 2456-8643

Body Weight and Feed Intake as well as Feed Conversion ratio showed that the higher body weight treatments consumed relatively more feed and had better utilization of feed. Decreased feed intake is one of the signs associated with *Ficus sycomorus* toxic effects. Garba *et al*. (2006) reported that doses of 0.2 to 12 g/kg of *Ficus sycomorus* root-bark extract induced a dose dependent loss of appetite in rats. It was suggested that the decrease in feed intake may have been partly due to the effect of the root-bark extract on the satiety centre (Guyton and Hall, 1996), indicating a central nervous system depressing effect. This means that increasing dietary levels of FSBP up to 8 g/kg of feed did not have any adverse effects on feed intake by the broilers.

3.2 Serum Total Protein and Albumin

At 36 days of age, the serum Total Protein levels for birds on 8FSBP were significantly higher *($P < 0.05$)* than those on 0FSBP and 6FSBP but not the birds on 2FSBP and 4FSBP. The broilers on 6FSBP had the lowest serum Total Protein levels. There were no other significant differences *($P>0.05$)* in serum Total Protein levels. Means for serum Total Protein levels at 36 and 43 days of age are in Table 2. Serum Albumin levels at 36 days of age also showed significant differences among treatments *($P<0.05$)*. Broilers on 8FSBP had significantly higher *($P < 0.05$)* serum Albumin levels than those on 6FSBP. The serum Albumin levels for birds on 0FSBP, 2FSBP and 4FSBP were not significantly different *($P>0.05$)* from those for 8FSBP. There were however, no significant differences in serum Albumin levels for the different dietary levels of *Ficus sycomorus* bark as determined at 43 days of age. Means for serum Albumin levels at 36 and 43 days of age are in Table 2. The Body weights at 22, 29, 36 and 43 days were positively correlated *($P < 0.05$)* to the serum Total Protein and Albumin levels at 36 days (Table 3). Meanwhile the serum Total Protein and Albumin levels at both 36 and 43 days were positively correlated *($P < 0.05$)* to each other. ALT activity at 36 days was negatively correlated *($P < 0.05$)* to serum Total Protein and Albumin levels at 43 days (Table 3).

Table 2:Means of Body Weight, Feed Intake, Feed Conversion Ratio, Alanine Aminotransferase, Serum Total Protein, Serum Albumin and Heterophil to Lymphocyte Ratio

Parameter[2] and Age of Birds	Treatment Diet[1]				
	0FSBP	2FSBP	4FSBP	6FSBP	8FSBP
Day 22 BW (g)	739 ± 26.9	702 ± 20.7	759 ± 16.4	690 ± 11.0	725 ± 14.4
Day 29 BW (g)	1165± 33.8	1152±26.1	1169± 26.3	1124± 26.5	1171± 28.3
Day 36 BW (g)	1590± 36.4	1578± 24.6	1631± 36.4	1547± 32.7	1616± 29.9
Day 43 BW (g)	1984± 36.6	1984± 28.0	2056± 24.7	1939±30.3	2057± 23.4

Vol. 3, No. 05; 2018

ISSN: 2456-8643

Day 43 TFI (g)	3787± 38.7	3706± 48.2	3827± 38.3	3784± 44.0	3800± 48.5
Day 43 FCR	1.9± 0.04	1.9± 0.02	1.9± 0.04	2.0± 0.02	1.8± 0.03
ALT (IU/L)					
Day 36	32.3 ± 1.7	34.2 ± 3.2	33.9 ± 3.1	33.1 ± 4.3	30.2 ± 3.3
Day 43	36.8 ± 1.9	39.7 ± 4.0	33.1 ± 4.1	31.0 ± 3.8	37.1 ± 2.3
Serum TP (g/dl)					
Day 36	2.8 ^{b}± 0.3	3.0 ^{ab}± 0.2	2.9 ^{ab}± 0.2	2.5 ^{b}± 0.1	3.5 ^{a}± 0.3
Day 43	3.9 ± 0.2	3.9 ± 0.4	3.9 ± 0.4	4.2 ± 0.4	4.1 ± 0.3
Serum Alb (g/dl)					
Day 36	1.7 ^{ab}± 0.2	2.0 ^{a}± 0.2	1.9 ^{a}± 0.2	1.2 ^{b}± 0.1	2.3^{a}± 0.3
Day 43	2.5 ± 0.3	2.4 ± 0.3	2.6 ± 0.4	2.4 ± 0.2	2.7 ± 0.3
H/L Ratio					
Day 22	0.31	0.26 ± 0.04	0.24 ±	0.31 ±	0.32 ±
Day 29	±0.06	0.34 ± 0.04	0.04	0.05	0.04
Day 36	0.43 ± 0.03	0.36 ± 0.06	0.38 ± 0.03	0.34 ± 0.05	0.45 ± 0.04
	0.40 ± 0.06		0.41 ± 0.03	0.43 ± 0.06	0.42 ± 0.08

[1]0FSBP indicates control (basal diet without FSBP). 2FSBP , 4FSBP, 6FSBP, and 8FSBP indicate basal diet supplemented with FSBP at 2, 4, 6 and 8 g/kg, respectively.
[2]BW = Body weight; TFI = Total feed intake; FCR = feed conversion ratio; ALT = Alanine aminotransferase; TP = Total Protein; Alb = Albumin; H/L Ratio = Heterophil to Lymphocyte Ratio
[a-b]Mean values within a row having different superscripts are significantly different *(P <0.05).*

The liver metabolism of Total Protein and Albumin appears to have been positively affected by the inclusion of FSBP up to 8 g/kg in the feed of broilers. This means that constituents in the bark caused an increase in protein synthesis in the liver which may have contributed to higher body weights. Filipović *et al.*, (2007) found that the concentration of total protein in chicken serum showed a constant increase during periods of rapid growth and that there was a concurrent increase in albumin concentration. Albumin serves as a depot of proteins and as a source of amino acids. Albumin is the most preferred source of amino acids for synthesis of tissue proteins. Albumin also participates in transporting fatty acids, minerals and vitamins. Hepatotoxicity leads to a decrease in albumin production (Thapa and Walia, 2007) due to direct inhibition of synthesis by toxins (Burtis *et al.*, 2008) and has often been used as a supplementary test for hepatic biosynthetic functions (Singh *et al.*, 2011, Ekpenyong *et al.*, 2012; Mordi and

Vol. 3, No. 05; 2018

ISSN: 2456-8643

Akanji, 2012; Elgaml , 2014). Hepatotoxic effects of the dietary FSBP levels would therefore, have been indicated by decreased levels of serum Albumin.

Sandabe *et al*. (2007) found that the administration of extracts prepared from *Ficus sycomorus* stem-bark powder to rabbits at dosages of up to 200 mg/kg body weight did not affect serum Total Protein levels. The positive relationship between the Body Weights throughout the experimental period and the 36 day serum Total Protein and Albumin levels could be another indicator that increasing consumption of *Ficus sycomorus* in the feed, up to 8FSBP, stimulated increased levels of albumin and general protein synthesis in the liver resulting in higher body weights. There does not appear to be any hepatotoxic effect of the increasing *Ficus sycomorus* dietary levels to reduce albumin and general protein synthesis.

Table 3:Correlation Coefficients for Body Weight, Feed Intake, Feed Conversion Ratio, Heterophil to Lymphocyte Ratio, Alanine Transaminase Activity, serum Total Protein and serum Albumin

	H/L[1] 22	H/L[1] 29	H/L[1] 36	STP[2] 36	STP[2] 43	Alb[3] 36	Alb[3] 43	ALT[4] 36	ALT[4] 43	BW[5] 22	BW[5] 29
H/L[1] 22	1										
H/L[1] 29	.184	1									
H/L[1] 36	.056	.263	1								
STP[2] 36	.026	.226	.070	1							
STP[2] 43	.105	.297*	-.093	.180	1						
Alb[3] 36	-.028	.309*	.158	.870*	.247	1					
Alb[3] 43	.092	.359*	.058	.152	.753*	.239	1				
ALT[4] 36	.031	-.182	.349*	.112	-.358*	.139	-.304*	1			
ALT[4] 43	-.204	.178	.301*	.149	-.127	.234	-.068	.154	1		
BW22	.048	.299*	-.023	.380*	.292	.361*	.162	-.078	.045	1	
BW[5] 29	-.019	.187	.206	.332*	.033	.447*	-.020	.231	.101	.434*	1
BW[5] 36	.060	.175	.198	.397*	.106	.442*	.078	.155	.096	.474*	.889*
BW[5] 43	-.071	.064	.106	.430*	.130	.493*	.066	.043	.156	.383*	.620*
FI[6] 43	.019	-.028	.089	.061	.208	.054	.213	-.214	-.207	.211	.052
FCR[7] 43	.077	-.082	-.025	-.367*	.021	-.431*	.086	-.193	-.290	-.261	-.476*

Correlations continued

	BW[5] 36	BW[5] 43	FI[6] 43	FCR[7] 43
BW[5] 36	1			
BW[5] 43	.765*	1		
FI[6] 43	.279	.315*	1	.
FCR[7] 43	-.357*	-.743*	.398*	1

*. Correlation is significant at the 0.05 level (Pearson's correlations -2-tailed)
[@]22; 29; 35; 43 = Days of age of the birds
[1]H/L = Heterophil to Lymphocyte ratio
[2]STP = Serum Total Protein
[3]Alb = Albumin
[4]ALT = Alanine aminotransferase
[5]BW = Body Weight
[6]FI = Feed intake
[7]FCR = Feed conversion ratio

3.3 Alanine aminotransferase (ALT)

There were no significant differences *(P > 0.05)* in ALT activities among the different dietary levels of *Ficus sycomorus* bark. Means for serum ALT activity at 36 and 43 days of age, are in Table 2. There was a negative relationship between ALT activity at 36 days and Albumin and Total Protein levels at 43 days.

Dietary levels of up to 8 g/kg FSBP did not affect the levels of ALT activity in the broilers. This means that there was no damage or necrosis of the liver cells in the broilers. Studies have shown that high doses of *Ficus sycomorus* bark extracts can produce toxic effects in rats. Doses of 0.2 to 12 g/kg of *Ficus sycomorus* root-bark extract produced, within 24 hours, physical signs of toxicity as well as changes in liver tissue (Garba *et al*., 2006). Liver injuries are reported to be caused by interference with metabolic pathways essential for parenchymal cell integrity. They lead to diversion, competitive inhibition or structural distortion of molecules essential for metabolism or to selective blockade of key metabolic pathways required to maintain the intact hepatocyte. The biochemical and physiological lesions induced by these agents lead to degenerative changes such as steatosis, necrosis or both. Tannic acid and Pyrrolidizine alkaloids are known to interfere with protein synthesis by introducing biochemical lesions into the cell and necrosis follows (Zimmerman, 1978). The process of liver damage is accompanied by a rise in liver enzyme levels in the blood.

Sandabe *et al.* (2007) administered extracts prepared from *Ficus sycomorus*stem-bark powder to rabbits. At dosages of up to 200mg/kg body weight the extracts did not affect serum ALT levels.

Vol. 3, No. 05; 2018

ISSN: 2456-8643

Ashade *et al.* (2014) administered aqueous leaf extract of *Ficus sycomorus* at dosages of up to 1600 mg/kg body weight and reported that these dosages had not resulted in significant change in ALT or any other hepatic cellular indices. Analysis of Total Phenolic Content of *Ficus sycomorus* leaves, twig-bark and stem-bark revealed that concentration of phenolic compounds increases from the leaves down to the stem bark, therefore further down the tree, the roots are expected to have higher levels of tannins than the leaves and stem-bark. This could be the reason why the leaves and stem bark may not have affected liver function when administered at the same dosages that the root extracts appear to have had detrimental effects.

The negative relationship between ALT activity at 36 days and Albumin and Total Protein levels at 43 days further confirms that liver function at 36 days of age was good, such that ALT activity was low and showed no signs of hepatotoxic injury with increasing levels of FSBP. The good functioning of the liver effected better albumin and protein synthesis with increasing FSBP intake which, could still be observed at 43 days of age.

3.4 Heterophil to Lympocyte ratio

There were no significant differences *(P>0.05)* in Heterophil to Lymphocyte ratio for the different dietary levels of *Ficus sycomorus* bark at any of the ages of broilers at which Differential Leucocyte Counts were done. Means for Heterophil to Lymphocyte ratio for 22, 29, and 36 days of age, respectively, are in Table 2.

The Heterophil to Lymphocyte ratios for the five levels of FSBP showed that inclusion of bark powder up to 8 g/kg feed did not result in hepatotoxic stress. Studies by Sandabe *et al.* (2007) in which dosages of up to 200mg/kg body weight of extracts prepared from *Ficus sycomorus* stem-bark powder were administered to rabbits showed no effects of the extracts on the White Blood Cell count.

3.5 Experimental Dietary levels of FSBP were lower than known*Ficus sycomorus* toxic levels

Overall, the dietary levels of FSBP up to 8 g/kg did not appear to have any toxic effects on the broilers. In acute toxicity studies Bello *et al.* (2013) administered to rats an extract which was prepared from air-dried and finely ground *Ficus sycomorus* stem-bark. They found the LD_{50} of the extract to be 1500 mg/kg body weight. According to classification of levels of toxicity based on the dose compounds of slight toxicity will have LD_{50} between 1000 and 5000 mg/kg. Bello *et al.* (2013) concluded that the*Ficus sycomorus* stem-bark is slightly toxic hence its extract can be safely used ethno medically at lower doses. They used 200 g of the bark to produce 8.82 g of dry extract, indicating that 34 g of bark would be required to produce 1.5 g of extract. Safe dosages of the stem-bark were therefore concluded to be below 34 g/kg body weight. Based on feed intake by the broilers in the experiment, amounts of FSBP consumed over a period of 42 days were estimated to average 0, 7.4, 15.3, 22.7 and 30.4 g for 0FSBP, 2FSBP, 4FSBP, 6FSBP and

Vol. 3, No. 05; 2018

ISSN: 2456-8643

8FSBP, respectively. The daily intakes of FSBP making up these amounts were therefore, too low to induce signs of toxicity.

4.0 CONCLUSION

Inclusion of up to 8 g *Ficus sycomorus* bark per kg of broilerfeed does not have any hepatotoxic effects. The bark stimulates higher Albumin and Total Protein synthesis by the liver at levels that are positively correlated to body weight gain and therefore are not related to any hepatotoxic effects. These levels of the bark in feed do not increase Alanine aminotransferase activity and the Heterophil to Lymphocyte ratio is not affected by the bark levels, indicating that the dietary levels of up to 8 g of bark per kg of feed do not induce any detectable hepatotoxic stress on the birds.

5.0 Acknowledgements

I am very grateful to the University of Zambia administration and Staff Development Office for the financial support toward meeting the research expenses. Thanks to all the staff of the Animal Science Department for all the support rendered. My appreciation especially to Mr S. Mungili, Mr O.C. Moonga and Ms E. Mazwarira for their great support during the broiler feeding trials at the Department of Animal Science Field Station. Many thanks to Dr Simuunza, the then Head of Department for Clinical Studies, School of Veterinary Medicine for the support toward the blood analyses.

REFERENCES

Adeshina G.O., C.E. Okeke, N.O. Osuagwu, and J.O. Ehinmidu. 2009. Preliminary studies on antimicrobial activities of ethanolic extracts of *Ficus sycomorus* Linn. and F*icus platyphylla* Del. (Moraceae). International Journal of Biological and Chemical Sciences, 3(5): 1013-1020.

Andrade, B. J., M.Robles, A. Fernandez-Castaner, S. Lopez-Ortega, M C.Lopez-Vega, and M. I. Lucena. 2007. Assessment of drug induced hepatoxicity in clinical practice: A challenge for gastroenterologists. World Journal of Gastroenterology, 13 (3): 329 – 340.

Ashade, N. O., H.T. Kabara, I. Yunusa, S. Bala, A. Ibrahim, A. S. Ibraheem, and U. V. Inekwe. 2014. Sub-chronic administration of aqueous leaf extract of *Ficus sycomorus* on some liver and kidney function indices in rats. Bayero Journal of Pure and Applied Sciences, 7(1): 72–74

Bello, O.M., M.K. Gafar, H. Abdullahi and Zack A.M. 2013. In vivo toxicity studies and phytochemical screening of stem bark of *Ficus sycomorus* Linn (Moraceae). Asian Journal of Science and Technology, 4(12): 045-047

Benichou, C. 1990. Criteria of drug-induced liver disorders: Report of an International Consensus Meeting. Journal of Hepatology. 11(2): 272 – 276.

Vol. 3, No. 05; 2018

ISSN: 2456-8643

Bernhoft, A., 2010. A brief review on bioactive compounds in plants. In: Proceedings from a symposium held at The Norwegian Academy of Science and Letters, Oslo,Norway.

Burtis, C.A., E.R. Ashwood, D.E. Bruns and B.G. Sawyer. Eds. 2008. Tietz fundamentals of clinical chemistry. 6th Edition. Saunders Elsevier, Philadelphia, PA, USA. ISBN: 978-0-7216-3865-2

Croteau, R., Kutchan, T.M., Lewis, N.G., 2000. Natural products (secondary metabolites). In: Buchanan, B., Gruissem, W., Jones, R. (Eds.), Biochemistry and Molecular Biology of Plants. American Society of Plant Physiologists, Rockville, MD, pp. 1250–1318.

Davis, A. K., D. L. Maney and J. C. Maerz. 2008. The use of leukocyte profiles to measure stress in vertebrates: a review for ecologists. Functional Ecology, 22: 760–772

Ekpenyong, C.E, E E Akpan and N.S. Udoh. 2012. Phytochemistry and toxicity studies of *Telfairia Occidentalis* aqueous leaves extract on liver biochemical indices in wistar rats. American Journal of Medicine and Medical Sciences, 2(5): 103-110

Elgaml, S. A. 2014. Ameliorative effect of Korean red ginseng (Panax ginseng) on selenium induced hepatic toxicity in broilers. International Journal of Advanced Research, 2 (9): 645-653

Filipović, N., Z. Stojević, S. Milinković-Tur, B. Beer Ljubić, M. Zdelar-Tuk. 2007. Changes in concentration and fractions of blood serum proteins of chickens during fattening. Veterinarski arhiv, 77: 319-326.

Garba S.H, J. Prasad and U.K. Sandabe. 2006. Histormorphological effects of the Aqueous roots bark extract of *F. sycomorus* on the liver and the kidney of Albino Rats; International Journal of Pharmacology, 2(6): 628 – 632

Gomez, K.A. and A.A. Gomez. 1984. Statistical procedures for agricultural research. John Wiley & Sons. New York.

Guyton, A.C. and J.E. Hall. 1996. Textbook of medical physiology.9th Edition. USA: W.B. Saunders Company, p 891

Hassan, S.W., M. Lawal, B.Y. Muhammad, R.A. Umar, L.S. Bilbis, U.Z. Faruk and A.A. Ebbo. 2007. Antifungal activity and phytochemical analysis of column chromatographic fractions of stem-bark extracts of *Ficus sycomorus* L. (Moraceae). Journal of Plant Sciences, 2(2): 209-215

Hochleithner, M. 1994 Biochemistries: In Avian medicine: Principles and application. Ritchie B, G..J. Harrison and L.R. Harrison (eds). p223-227

Vol. 3, No. 05; 2018

ISSN: 2456-8643

Huang, X.J., Y.K. Choi, H.S. Im, O. Yarimaga, E. Yoon and H.S. Kim. 2006. Aspartate aminotransferase (AST/GOT) and alanine aminotransferase (ALT/GPT) detection techniques. Sensors, 6: 756-782

Kumar V, A.V. Elangovan, A.B. Mandal, P.K.Tyagi, S.K. Bhanja and Dash B.B. 2007. Effects of Feeding Raw or Reconstituted High Tannin Red Sorghum on Nutrient Utilisation and Certain Welfare Parameters of Broiler Chickens. British Poultry Science, 48 (2): 198 – 204

Lansky, E P and H M Paavilainen. 2011. Figs: The Genus *Ficus.* Traditional herbal medicines for modern times. CRC Press, Taylor and Francis Group, 6000 Broken Sound Parkway NW, Suite 300, Boca Raton, FL 33487-2742. ISBN: 78-1-4200-8966-0

Little, T.M. and J.F. Hills. 1978. Agricultural experimentation, design and analysis. John Wiley and Sons. New York

Maxwell, M. H., and G. W. Robertson. 1998. The avian heterophil leucocyte. World's Poultry Science Journal, 54: 155–178.

Mordi, J.C. and M.A. Akanji. 2012. Phytochemical Screening of the Dried Leaf Extract of *Cnidoscolus aconitifolius* and Associated Changes in Liver Enzymes Induced by its Administration in Wistar Rats. Current Research Journal of Biological Sciences, 4(2): 153-158.

Ortiz, L.T., R. Alzueta, J. Trevino and M. Castano, 1994. Effects of faba bean tannins on the growth and histological structure of the intestinal tract and liver of chicks and rats. British Poultry Science, 35: 743-754.

Puvadolpirod, S., and J. P. Thaxton. 2000a. Model of physiological stress in chickens: 1. Response parameters. Poultry Science, 79: 363–369.

Puvadolpirod, S., and J. P. Thaxton. 2000b. Model of physiological stress in chickens: 2. Dosimetry of adrenocorticotropin. Poultry Science, 79: 370–376.

Puvadolpirod, S., and J. P. Thaxton. 2000c. Model of physiological stress in chickens: 3. Temporal patterns of response. Poultry Science. 79: 377–382.

Saleh, B., and A. Al-Mariri. 2017. Phytochemical constitutes of *Ficus sycomorus* L. and inhibitory effect of their crude extracts against bacterial pathogens. Journal of Natural Products, Vol. 10: 06-14

Saleh B., Hammoud R., Al-Mariri A., (2015): Antimicrobial activity of *Ficus sycomorus* L.(*Moraceae*) leaf and stem-bark extracts against multidrug resistant human pathogens. *Herba. Pol*., 61: 39-49.

Vol. 3, No. 05; 2018

ISSN: 2456-8643

Sandabe UK, Onyeyili PA, Chbuto G A. 2006. Phytochemical Screening and effect of aqueous extract of *Ficus sycomorus* L. (Moraceae) stem bark on muscular activity in laboratory animals. J Ethopharmacol; 104: 283-285.

Sandabe, U.K., F. Abdurrahama, B.Goniri, and U. Baba. 2007. The combined effects of aqueous extract of *Ficus sycomorus* L. (Moraceae) stem bark and *Nigella sativa* L. (Ranunculaceae) seeds on hematological and biochemical parameters in rabbits. Animal Research International, 4(3): 753–757

Siegel, H. S. 1995. Stress, strains, and resistance. British Poultry Science, 36: 3–22.

Singh, A., T.K. Bhat, and O.P. Sharma. 2011. Clinical biochemistry of hepatotoxicity. Journal of Clinical Toxicology, S4:001: 1-19.

Thapa, B.R. and A. Walia. 2007. Liver function tests and their interpretation. Indian Journal of Pediatrics, 74: 663-671.

Zimmerman, H.J. 1978. Hepatotoxicity: the adverse effects of drugs and other chemicals on the liver. New York, Appleton-centenary-crofts, p 234.