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Research Article

Effect of Feeding Mango and *Senna occidentalis* Leaf Meals as Replacement to Prophylactic Antibiotic Use on Performance of Broiler Chickens

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ABSTRACT
A total of 180-day-old broiler chicks were used to evaluate the effect of feeding mango and Senna leaf meal as a replacement to prophylactic antibiotics use on the performance of broiler chickens. The birds were fed mango (MLM) and senna leaf meal (SLM) at 0g, 5gMLM, 7.5gMLM, 5gSLM and 7.5gSLM as treatments in a completely randomized design. Data on phytochemicals, growth performance, carcass characteristics, and haematological and serum biochemical parameters were collected. Data collected were subjected to variance analysis. The results show that flavonoids, alkaloids, saponins, tannin and phenol were present in Mango *and* Senna leaf meals. Total feed costs in diets containing the different levels of MLM and SLM were lower (P<0.05) compared to the control. The feed cost per kg gain was also higher (P<0.05) in the control group compared to 5gMLM. Mortality was higher in the control compared to those fed the different leaf meals. The breast weight of the 5gMLM was higher (P<0.05) than that of 7.5gMLM and 5gSLM. The PCV of the group fed with 5gSLM was lower (p<0.05) compared to the control group and those fed with 5gMLM, 7.5gMLM, and 7.5gSLM. The WBC was higher (p<0.05) in the control group and 5gSLM compared to those fed with 5gMLM and 7.5gSLM. From the results, it can be concluded that 5gM resulted in better growth performance without adverse effects on haematological and serum biochemical parameters. Hence, it is recommended that 5gMLM can be used in the diets of broiler chickens in place of prophylactic antibiotics.

Keywords: Broiler chicken; Antibiotics; Prophylactic; Leaf meal

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INTRODUCTION

The utilization of antibiotics in intensive livestock production has led to the development of antimicrobial resistance in livestock and humans, which is a growing threat to sustainable food production and public health (O'Neill, 2015; WHO, 2015). There is therefore an urgent need to eradicate or lower the usage of antibiotics in livestock production so as to minimize the antimicrobial resistance scourge (O'Neill, 2015). The phytogenic plants and extracts are gaining recognition as new feed additives to replace antibiotic usage in animal feeds (Zhang *et al.,* 2017). Considerable evidences suggest that medicinal plants may be good candidate as alternative to synthetic additives and their effects on immunity, gut microbiota, and antioxidant status (Zhang *et al*., 2017; Vase-Khavari *et al*., 2019; Adu *et al*., 2020) in broiler chickens have been documented. Nonetheless, research outcomes have been largely incoherent. Against this background, the exposition of the antimicrobial and antioxidant potentials of medicinal plants requires, at least, some degree of consistent and systemic trials in myriad production systems.

Mango leaves and their extracts have high content of phenolic compounds containing mangiferin, flavonoids, benzophenone, and gallotannins which have high antioxidant activity (Kanwal *et al*., 2010; Fernández-Ponce *et al.,* 2015). Moreover, the mango leave extract has been demonstrated to have analgesic, anti-diarrheal, anti-inflammatory, antimicrobial, and antifungal activities, as well as hypoglycemic effects in rats (Islam *et al*. 2010). *Senna occidentalis* is an annual or perennial plant which is used in several traditional medicines to cure various diseases. Modern pharmacological studies revealed that the *cassia occidentalis* has several biological activities such as blood purifier, expectorant, liver disease (Mahanthesh *et al.,* 2019). This study was conducted to evaluate the effect of feeding mango and senna leaf meals as replacement to synthetic additives on performance of broiler chicken.

MATERIALS AND METHODS

Experimental Site

The research was conducted at the Prof. Lawal Abdu Saulawa Livestock Teaching and Research Farm of the Animals Science Department, Federal University Dutsin-Ma, Katsina State, Nigeria. Dutsin-Ma lies on latitude 12°26'N and longitude 07°29'E while the farm site lies between latitude 12°27ˈ18ˈ North and 7°29ˈ29ˈ East (GPS, 2022) with an average rainfall of 700mm. The mean annual temperature ranges from 29°C – 31°C (Shamsuddeen, 2018).

Source of Experimental Materials

The broiler chickens, feeders, drinkers, mango and Senna leaves were all sourced from Dutsin-Ma and Katsina metropolis. The experiment lasted for a period of six (6) weeks.

Collection and processing of mango and Senna leaves

Fresh Mango and Senna leaves were collected at the premises of Livestock Teaching and Research Farm, Federal University Dutsin-ma. The leaves were air dried, ground into powder, and stored in an airtight container prior to phytochemical analysis and feed preparation.

Phytochemical Screening of Mango and Senna leaves

Samples of dried mango and Senna leaves were taken to the Laboratory of the Faculty of Pharmaceutical Sciences, Ahmadu Bello University Zaria for qualitative and quantitative determination of phyto-chemical constituents comprising; alkaloids, flavonoids, tannins, saponins, steroids, glycosides and anthroquinones by using standard methods as described by Harborne (1998) and Sazada *et al.* (2009).

Experimental design and management

A total of 180 day-old broiler chicks were used for the study. Upon arrival, the chicks were weighed and randomly distributed into 15 pens. The pens were randomly allotted to the following treatments in a completely randomized design;

Treatment one – Prophylactic Antibiotic
Treatment two - 5g/kg Mango Leaf meal (5gMLM)
Treatment three – 7.5g/kg Mango Leaf meal (7.5gMLM)
Treatment four - 5g/kg Senna Leaf meal (5gSLM)
Treatment five – 7.5g/kg Senna Leaf meal (7.5gSLM)

Each treatment had three replications of 12 chicks each. A starter (1–21 days) and finisher (22–42 days) diet were formulated according to the National Research Council (NRC, 1994) requirements. The birds were vaccinated against infectious bursa disease on 7 and 21 days, and Newcastle disease on 14 and 28 days. Treatment one was given Floricol® (each 1ml contains Florfenicol 100mg).

Measurements

Proximate composition

The proximate composition of the basal diets was determined according to the methods of AOAC (2000).

Growth performance

Weekly record of feed intake (FI) and body weight (BW) per pen was taken. Average daily gain (ADG) and feed conversion ratio (FCR) were calculated.

Blood sampling and analysis

On d 38, blood samples were collected via wing vein into EDTA and plain bottles. Serum was obtained after centrifuging (3000g, 10ºC, 15 min) the blood samples in the plain bottles. Haematology and serum biochemical indices were assessed as described by Adeyemi *et al*. (2020).

Carcass evaluation and assessment of lymphoid and other organs

On d 42, the birds were deprived of feed but not water overnight. Four birds per pen was randomly selected and slaughtered by severing the jugular vein. Carcasses were manually defeathered and eviscerated. The weight of abdominal fat, carcass, and different carcass cuts were measured. Dressing percentage and relative weights of prime cuts were calculated. Lymphoid organs including liver and spleen were collected from the eviscerated carcasses above and weighed. Other internal organs such kidney, gizzard and heart were weighed and recorded.

Table 1: Composition of the Experimental Diets

Ingredients	Starter	Finisher
Maize	56.80	56.00
Soyabean meal	39.00	30.00
Wheat offal	0.00	8.80
Limestone	0.40	0.50
Bone meal	3.00	3.00
Palm oil	0.00	1.00
Salt	0.25	0.25
Premix	0.25	0.25
Methionine	0.20	0.2
Threonine	0.1	0.1
Total	100	100
Calculated Analysis		
ME (kcal/kg)	2916	2944.88
Crude protein (%)	23	19.95
Crude fibre (%)	2.8	3.24
Ether extract (%)	2.56	2.54
Calcium (%)	1.32	1.32
Phosphorus (%)	0.87	0.88
Methionine (%)	0.52	0.49
Lysine (%)	1.51	1.24

RESULTS AND DISCUSSIONS

Phytochemical Content of MLM and SLM

The phytochemical content of MLM and SLM is shown in Table 2. From the results, flavonoids were higher in Mango leaf (12.5%) compared to Senna leaf (10.30%). Alkaloids and Saponins are also higher in Mango leaf compared to Senna leaf (6.00 vs. 4.60%) and (4.50 vs. 3.00%) respectively. Senna leaf meal has higher tannin and phenol content (7.20 and 11.10%) compared to Mango leaf meal (4.86 and 5.64%). The phytochemical content of the mango leaf was comparable to those obtained by Adeyemi *et al.* (2021) who reported that Mango leaf contained saponin (3.07 mg/100 g), phenols (93.22 mg GAE/g DW), flavonoids (79.68 mg QE/g DW), alkaloids (0.90 mg/100 g DW), and tannins (0.53 mg/100 g DW).

The results of this study are in line with the findings of Omoikhoje *et al.* (2018) who also conducted the phytochemical screening of *Senna occidentalis* leaf meal revealed the presence of saponins, phenols, flavols, flavonols and alkaloids. The presence of saponins indicates that the leaf meals might exhibit hypocholesterolemic activity while phenols are known to impart taste, odour, colour and oxidative stability in plant based foods (Omoikhoje *et al.,* 2018). Omoikhoje *et al.* (2018) further highlighted that flavonoids act as antioxidants as well as antimicrobial agents against a wide range of microorganisms by inhibiting their membrane bound enzymes, promote growth, repair of worn out tissues, build hormones that assist in the regulation of body processes and build antibodies that fight infections and diseases while the presence of alkaloids in them samples shows their potential protective metabolic roles.

Effect of MLM and SLM on Growth Performance of Broiler Chicken

The result on the effect of sole MLM and SLM on growth performance of broiler chicken is presented in Table 3. The result shows that there is no significant difference (P>0.05) in Initial weight of birds and this clearly indicated the homogenous nature of experimental birds in the initial start-up of the trial. The final weight, weight gain, total feed intake and feed conversion ratio were not influenced (P>0.05) by the feeding of the different leaf meals at varying inclusion levels. However, total feed cost, feed cost per kilogram gain and mortality were significantly affected (P<0.05). The total feed cost in diets containing the different levels of MLM and SLM having lower (P<0.05) total feed cost compared to the control. The feed cost per kg gain was also higher (P<0.05) in the control group compared to 5g MLM. Those fed 7.5g MLM, 5g SLM and 7.5g SLM had similar feed cost per kg gain with the control. Mortality was higher in the control compared to those fed the different leaf meals.

Table 2: Phytochemical Composition (%) of MLM and SLM

Parameter	Mango leaf	Senna leaf
Flavonoids	12.50	10.30
Alkaloids	6.00	4.60
Saponins	4.50	3.00
Tannins	4.86	7.20
Phenol	5.64	11.10

Table 3: Effect of Sole Mango and Sole Senna Leaf Meal on Growth Performance of Broiler Chicken

Parameters	0g	5gMLM	7.5gMLM	5gSLM	75gSLM	SEM
Initial weight	105.556	96.970	105.556	99.747	102.778	3.395
Final Weight	1303.03	1317.17	1223.74	1156.82	1127.53	63.432
Weight gain	1197.47	1220.20	1118.18	1057.07	1024.75	61.961
Total feed intake	3951.8	3911.1	3882.5	3721.2	3621.2	109.374
Feed conversion ratio	3.312	3.210	3.479	3.560	3.539	0.145
Total feed cost (₦)	1406.38^{a}	1215.9^{b}	1216.73^{b}	1156.87^{b}	1134.84^{b}	34.849
Feed cost per kg Gain	1178.83^{a}	998.06^{b}	1090.48^{ab}	1106.86^{ab}	1109.02^{ab}	46.645
Mortality	8.333^{a}	0.000^{b}	0.000^{b}	2.778^{b}	0.000^{b}	1.242

$^{a, b, c}$ means with different superscripts along the same row differ significantly (P<0.05)

0g – Control (No leaf meal)
5gMLM, – 5g mango leaf meal per kg feed
75gMLM – 7.5g mango leaf meal per kg feed
5gSLM - 5g Senna leaf meal per kg feed
75gSLM – 7.5g Senna leaf meal per kg feed
SEM – Standard error of means

Contrary to the results of this study, Adeyemi *et al.* (2021) observed higher body weight gain in starter phase for broiler fed antibiotic supplemented diets compared to those fed Mango leaf meal diets. They however observed higher body weight gain in mango leaf supplemented groups compared to the unsupplemented group in the finisher phase. On the overall (starter and finisher phases), they reported higher body weight gain in the mango leaf fed birds compared to the unsupplemented birds. Also contrary to this study broilers fed an antibiotic supplemented diet consumed more feed than those fed mango leaf supplemented feeds in the starter phase while similar to this study, feed intake was similar in the finisher phase and the overall period (Adeyemi *et al.,* 2021). Similar to the observations of this study, Adeyemi *et al.* (2021) observed that FCR was similar for chicken fed antibiotic supplemented diets than the Mango leaf supplemented diets.

Antibiotics improve performance by lowering the gut pathogenic microbial load thereby improving the nutrient available to birds. The results obtained for the Mango and Senna leaf supplemented birds were comparable to those of the antibiotic group. This implies that both Mango and Senna leaf meals can be utilized as phytogenic feed additives. Phytogenic feed additives are known to have the ability to sift free radicals thereby maintaining the integrity of intestinal mucosa and consequently enhanced feed efficiency and body weight gain (Adeyemi *et al.,* 2021). The role of functional feeds or feed ingredients is becoming noticeable during the post-antibiotic era. With their active components, the functional feeds may exert beneficial impacts on the health and production traits of broiler chickens (Sugiharto *et al*., 2019). Among the sources of functional properties, green leaf has been known to naturally contain numerous active compounds that are beneficial for the health and wellbeing of both humans and animals. These bioactive components include phenols, flavonoids, alkaloids, saponins, tannins, terpenoids, steroids etc. (Sugiharto *et al*., 2019).

The reduced total feed cost and feed cost per kg gain observed in the leaf meal supplemented groups agrees with the submission of Sugiharto *et al*. (2019) that feeding of leaf meal may reduce the cost of feed in broiler production. Contrary to the findings of Adeyemi *et al.* (2021), mortality was affected by dietary treatments and was higher in the antibiotic group compared to the Mango and Senna leaf meals.

Effect of Sole SLM and MLM on Carcass Characteristics of Broiler Chicken

The results on the effect of feeding sole MLM and SLM on carcass characteristics of broiler chickens are presented in Table 4. The results revealed that there is no significant difference (P>0.05) in live weight, dressed weight and dressing percentage. Broiler chicken fed MLM and SLM had live weights ranging from 1475 to 1675 g/bird. Dressed weight ranged from 1000 to 1200g/bird while dressing percentage ranged from 66.45 to 72.48%.

The findings in this study are contrary to the observations of Sobayo *et al.* (2013) who reported decreased live weight, dressed weight and dressing percentage in broiler chickens fed bitter kola as a phytobiotic. The similarity in the observed parameters might be due to the fact that MLM and SLM at the levels used in this study did not affect feed intake and weight gain. Some plant additives like bitter kola have been shown to reduce the metabolic processes of broiler chicken and hence decrease live weight, dressed weight and dressing percentage of the birds (Sobayo *et al.,* 2013). Aduku and Olukosi, (2000) stated that dressing percentage of birds is affected by weight of birds, plane of nutrition, pre-slaughter activities and dressing method. Since these factors that affect dressing percentage were not greatly varied in this study, it is therefore seen that the diets had effect on dressing percentage.

Table 4: Effect of feeding SLM and MLM on carcass characteristics of broiler chickens

Parameter	0g	5gMLM	7.5gMLM	5gSLM	75gSLM	SEM
Dressed weight (g/bird)	1062.50	1200.00	1100.00	1075.00	1000.00	87.02
Dressing percentage	68.47	71.70	66.45	72.48	66.49	2.40
Primal Cuts*						
Breast weight %	23.54^{ab}	27.65^{a}	22.35^{b}	21.15^{b}	24.17^{ab}	1.50
Back weight %	7.87	10.28	10.48	9.91	7.46	1.04
Wings weight %	7.87^{ab}	10.28^{a}	9.70^{ab}	9.91^{a}	6.68^{b}	0.96
Thigh weight %	22.64	17.45	21.19	20.19	20.77	2.79
Neck weight %	8.05	9.59	9.70	7.61	8.30	0.85
Internal organs*						
Liver %	1.78^{ab}	1.75^{ab}	1.43^{b}	1.60^{ab}	1.82^{a}	0.11
Pancreas %	0.20	0.21	0.23	0.20	0.23	0.04
Gizzard %	1.57^{b}	1.69^{ab}	2.04^{a}	2.05^{a}	1.96^{ab}	0.13
Proventriculus %	0.31	0.36	0.42	0.43	0.38	0.04
Bile %	0.09	0.09	0.07	0.10	0.09	0.01
Intestine %	4.54^{b}	4.72^{ab}	4.99^{ab}	4.78^{ab}	5.58^{a}	0.30
Spleen %	0.09	0.08	0.08	0.11	0.08	0.02

$^{a, b, c}$ means with different superscripts along the same row differ significantly (P<0.05)

0g – Control (No leaf meal)
5gMLM, – 5g mango leaf meal per kg feed
75gMLM – 7.5g mango leaf meal per kg feed
5gSLM - 5g Senna leaf meal per kg feed
75gSLM – 7.5g Senna leaf meal per kg feed
SEM – Standard error of means
* Expressed as percentages of live weight

Feeding MLM and SLM did not influence (P>0.05) the back weight, thigh weight and neck weight. However, breast and wing weights were significantly affected (P<0.05) by the dietary treatments. Breast weight of the 5gMLM was higher (P<0.05) than that of 7.5gMLM and 5gSLM. 0g and 7.5g SLM had similar (P>0.05) breast weight with 5g MLM, 7.5g MLM and 5g SLM. %g MLM and 5g SLM had higher (P<0.05) wing weight compared to 7.5g SLM. 0g and 7.5g MLM had similar (P>0.05) wing weight with 5g MLM, 5g SLM and 7.5g SLM. In disagreement with the findings of this study, Adeyemi *et al.* (2021) observed that relative weight of carcass cuts were not influenced by feeding mango leaves and synthetic additives to broiler chickens.

Pancreas, bile, proventriculus and spleen weights were not affected (P>0.05) by feeding MLM or SLM as additives to broiler chickens. Liver, gizzard and intestinal weights were significantly affected (P<0.05) by the different diets. The 7.5gSLM had higher (P<0.05) liver weight compared to 7.5g MLM. Both 7.5g SLM and 7.5g MLM are however having similar (P>0.05) liver weights to 0g, 5g MLM and 5g SLM. Gizzards of the 7.5g MLM and 5g SLM were heavier (P<0.05) than that of the control (0g). 5g MLM and 7.5g SLM have similar (P>0.05) gizzard weights with the control, 7.5g MLM and 5g SLM.

The weight of intestine of broiler chickens fed MLM and SLM was higher (P<0.05) in the 7.5g SLM group compared to the control. 5g MLM, 7.5g MLM and 5g SLM have similar (P>0.05) intestinal weights to both the control and 7.5g SLM. The non-influence of the feed additives on spleen, bile and pancreas might be a clear pointer that both MLM and SLM were not toxic to the birds. This study shows hypertrophy of the liver, gizzard and intestine. The addition of the MLM and SLM might have increase the fibre content of the diets. Higher levels of fibre are known to increase the physical activity of digestive organs resulting in hypertrophy or hyperplacia of these organs (Rao *et al.*, 2004). Matthias and Hasan (2003) explained that switching from a standard diet to a high-fibre diet, increases the sizes of gizzard muscle and small intestine of Japanese quails. In the small intestine, decreasing quality of the food may be compensated by increasing intestinal length, circumference and surface magnification. With increasing digestive load to the intestine, we also expected the muscle layer to thicken.

Effect of MLM and SLM on Haematological Parameters of Broiler Chickens

The result on the effect of feeding MLM and SLM on haematological profile of broiler chicken is presented in table 5. The result shows that the PCV, Hb, WBC, Neutrophils, and Lymphocytes of the birds were significantly influenced (p<0.05) by feeding MLM and SLM at varying inclusion levels. The PCV of the group fed with 5gSLM was lower (p<0.05) compared to the control group and those fed with 5gMLM, 7.5gMLM, and 7.5gSLM. The Hb was higher (p<0.05) in birds fed with 5gMLM and 7.5gSLM compared to the group fed with 5gSLM. Those fed with 0g and 7.5gSLM had similar (P>0.05) Hb with the other treatments. The WBC was higher (p<0.05) in the control group and 5gSLM compared to those fed with 5gM and 7.5gS. Those fed with 7.5gM had similar WBC with the other groups.

The Neutrophils count was higher (p<0.05) in the birds fed with 7.5gMLM compared to 5gMLM and 7.5gSLM. Those fed with 5gSLM had higher (P<0.05) neutrophil count than 5gMLM and 7.5gSLM. Those fed with 5gMLM had similar (P>0.05) neutrophil count with the group fed the control, 5gSLM ang 7.5gSLM. The control group had similar (P>0.05) neutrophil count with the other treatments. The Lymphocytes was higher (p<0.05) in the 7.5gSLM group compared to the control group, 7.5gMLM and 5gSLM. Those with 5gMLM had similar (P>0.05) lymphocytes with the other treatment groups. The monocytes were not significantly affected (p>0.05) by feeding of the MLM and SLM at varying inclusion levels. The eosinophils and basophils were not detected in birds used in this study indicating that there was no parasite infestation.

The haemoglobin values of 7.35 to 9.30g/dl observed in this study were slightly higher than the values for broiler chicken fed mango leaf meal reported by Aka-Tanimo *et al.* (2020) who reported 7.89 to 8.53 g/dl at 2.5% to 7.5% mango leaf meal respectively.

Blood assay is a sensitive indicator that reveals the health status in animals and has been an indispensable tool in the diagnosis, treatment and prognosis of many diseases (Owen *et al.,* 2008). Blood has been shown as an important index of physiological, pathological and nutritional status in the animal (Ewuola *et al.,* 2004). That what`s necessitate the evaluation of blood constituents of broilers in this study. The packed cell volume values obtained in this study falls within the normal range of 22-35% for healthy broiler as reported by Odunitan-Wayas *et al.* (2018)**.** The haemoglobin values observed in this study are within the normal ranges of 7-13 g/dl reported by Odunitan-Wayas *et al.* (2018)**.** The normal values of Hb means that the birds in all treatment had normal cellular respiration within the tissues in their bodies and could transport oxygen round the body to the vital areas. Therefore, the Hb values indicate that no difficulties in effective cellular respiration of broiler birds in this study. Hb is responsible for cellular respiration which is important in metabolic reaction (Frandson 1981). The white blood cells aids to protect the body from pathogens with the normal range being 12-30 x 10^3µl **(**Odunitan-Wayas *et al.,* 2018).

Table 5: Effect of feeding MLM and SLM on Haematological Analysis

Parameters	0g	5gMLM	7.5Gmlm	5gSLM	75gSLM	SEM
PCV	25.50^{a}	26.75^{a}	25.00^{a}	20.00^{b}	26.00^{a}	1.315
Hb	8.65^{ab}	9.30^{a}	8.45^{ab}	7.35^{b}	9.00^{a}	0.420
WBC	28.40^{a}	20.68^{b}	23.05^{ab}	28.48^{a}	19.60^{b}	2.314
Neutrophils	37.75^{abc}	36.25^{bc}	43.50^{a}	41.75^{ab}	$32.50b^{c}$	1.835
Lymphocyte	59.00^{b}	62.50^{ab}	56.25^{b}	55.00^{b}	72.75^{a}	3.546
Monocytes	0.75	1.25	0.25	0.75	0.00	0.465
Eosinophil	0.00	0.00	0.00	0.00	0.00	0.00
Basophils	0.00	0.00	0.00	0.00	0.00	0.00

$^{a, b, c}$ means with different superscripts along the same row differ significantly (P<0.05)

0g – Control (No leaf meal)
75gMLM – 7.5g mango leaf meal per kg feed
75gSLM – 7.5g Senna leaf meal per kg feed
5gMLM, – 5g mango leaf meal per kg feed
5gSLM - 5g Senna leaf meal per kg feed
SEM – Standard error of means

Effect of Feeding Mango Leaf Meal and Senna Occidentalis Meal on Serum Biochemical Analysis

The serum biochemical profile of broilers fed mango leaf meal and senna occidentalis meal were presented in Table 6. The result shows that there is no significant difference (p>0.05) in sodium ion across the different levels of either MLM or SLM. Broiler chicken fed 5gSLM has higher (P<0.05) potassium ion (k^+) in their serum compared to the rest of the treatments which were all similar (P>0.05). The different levels of MLM and SLM had no effect (P>0.05) on chlorine (Cl) and HCO_3^- ions. There is significant difference (P<0.05) in serum urea with the control and 5gm having higher urea than 7.5gMLM and 7.5gSLM. 5gSLM has similar (P>0.05) urea to the rest of the treatments. Creatinine content was not influenced (P>0.05) by the dietary treatments. Total bilirubin (TB) was statistically influenced (P<005) with 7.5gMLM having higher content than the control and 7.5gSLM. The control has similar TB content to 5gMLM, 5gSLM and 7.5gSLM.

Table 6: Effect of Feeding Mango Leaf Meal and *Senna occidentalis* Meal on Serum Biochemical Analysis

Parameters	0g	5gMLM	7.5gMLM	5gSLM	75gSLM	SEM
Na^+	129.00	127.50	128.50	127.25	126.75	1.193
K^+	2.68^b	2.69^b	2.44^b	3.35^a	2.35^b	0.160
Cl^-	76.25	79.50	77.25	80.00	74.50	3.758
HCO_3^-	29.00	27.50	26.75	29.00	28.50	0.715
Urea	2.75^a	2.65^a	1.88^b	2.54^{ab}	1.85^b	0.217
Creatinine	49.75	45.50	48.75	50.50	39.75	4.457
Total bilirubin	1.37^{bc}	1.62^{ab}	1.86^a	1.70^{ab}	1.18^c	0.108
Conjugated bilirubin	0.25^c	0.35^{bc}	0.55^{ab}	0.60^a	0.38^{bc}	0.068
Aspartate aminotransferase	10.00	9.00	9.50	8.50	9.00	0.483
Alanine aminotransferase	8.00^{ab}	8.50^a	7.00^b	6.50^b	6.50^b	0.465
Alkaline phosphatase	147.25	148.75	151.25	147.75	148.00	3.870
Total protein	6.58	6.65	6.53	6.75	6.73	0.143
Albumin	3.40	3.55	3.60	3.55	3.55	0.100
Total cholesterol	3.15^b	3.18^b	3.58^{ab}	3.73^a	3.58^{ab}	0.152
High density lipoproteins	0.58^b	0.55^b	0.81^a	0.85^a	0.63^{ab}	0.072
Low density lipoproteins	1.91	2.04	2.03	2.15	2.33	0.134
Triglycerides	1.33^b	1.33^b	1.38^b	1.60^a	1.36^b	0.067

$^{a, b, c}$ means with different superscripts along the same row differ significantly (P<0.05)
0g – Control (No leaf meal)
75gMLM – 7.5g mango leaf meal per kg feed
75gSLM – 7.5g Senna leaf meal per kg feed
5gMLM, – 5g mango leaf meal per kg feed
5gSLM - 5g Senna leaf meal per kg feed
SEM – Standard error of means

The conjugate bilirubin was however higher in the 5gSLM compared to the control, 5gMLM and 7.5gSLM. Aspartate aminotransferase was not affected the different leaf meals. Alanine aminotransferase was significantly different (P<0.05) with 5gM having higher content than all the other treatments except the control. Alkaline phosphatase was similar across the treatments. Total protein and albumin were not influenced (P>0.05) by the treatments. Total Cholesterol was significantly different (P<0.05) across the treatments. 5gSLM has higher total cholesterol than the control and the 5gMLM groups. 7.5gMLM and 7.5gSLM groups have similar cholesterol content with the control, 5gMLM and 5gSLM. High density lipoprotein is higher (P<0.05) in 7.5gMLM and 5gSLM compared to control and the 5gMLM groups. The 7.5gSLM group have similar high density lipoprotein to the rest of the treatments. In the low density lipoprotein, no significant difference resulted as a result of differences levels of inclusion to the treatments. There exists significant difference in serum triglycerides of the broiler chickens with 5gSLM having higher content compared the other treatments which were similar amongst themselves. The sodium values in this study are fall slightly below the ranges of serum sodium levels reported by Hu *et al.* (2022). This may be linked to numerous factors such as diets type, influenced of testing materials, stage of growth, physiological status of experimental birds and birds strain.

CONCLUSION

The leaf meals of mango and senna at the levels studied were not detrimental to the health of the birds. The addition of 5gM/kg resulted in better growth performance as well as haematological, serum biochemical parameters and lower cost of feeding. It could be recommended that 5gM can be included in the diets of broiler chicken.

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