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EFFECT OF DIETARY SUPPLEMENTATION OF DRIED SPONDIAS MOMBIN LINN LEAF ON THE PERFORMANCE AND BLOOD PROFILE OF BROILER CHICKEN

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ABSTRACT
This experiment was carried out to investigate the effect of supplementing different levels of Spondiasmombin leaf meal on the performance and blood profile of broiler chickens. Experimental parameters covered growth performance and some heamatological and blood serum analysis. One hundred and sixty, day old Arbo acre broiler chicks were randomly divided into four treatments groups with four (4) replicates, each of ten birds in a Completely Randomized Design (CRD). Group 1 was fed basal diet without Spondiasmombin leaf meal (SSM), Group 2, 3 and 4 were fed basal diets supplemented with SSM at levels of 1.0%, 2.0% and 3.0% respectively. The basal diet was formulated to meet the nutritional requirements of broilers according to NRC (1994), the experiment lasted for 49 days and the results obtained showed that there were significant (P<0.05) differences among all treatments in the values of final live weight and feed conversion ratio. No significant difference (P>0.05) was observed for the daily feed intake of the birds. Results for heamatology showed that white blood cell counts, RBC, Hb and PCV were significantly (P<0.05) affected with the inclusion of Spondiasmombin leaf meal, SGPT, SGOT and other serum parameterswere not significantly different (P>0.05) during the experiment. No mortality was recorded throughout the experimental period. Results obtained from this study showed that Spondiasmombin leaf meal is a good source of plant vitamins and minerals and its inclusion at 3.0% level does not have any deleterious effect on the general performance and health status of broiler chicken.
Key words: Broiler chicken, performance, heamatological parameters, serum analysis

Introduction

For many years, antibiotics have been used in the poultry industry. However, the misuse or continuous use of antibiotics has led to the emergence of the antibiotics residue and drug resistance. Now a day's use of antibiotics as growth promoter in animal nutrition is facing reduced social acceptance and their use has been banned or curtailed in many countries Barug et al (2006) which has led to investigation to alternative feed additives in animal production.The success of modern animal production in supplying large quantity of low cost feed to the human population depends to a large extent on the judicious and creative use of feed additives. A feed additive (medicinal plant) plays a significant role in maintaining an animal's health, improving the characteristics of feed and growth performance. According to Duduku et al(2011), medicinal plants have some properties being anti-inflammatory, antiseptic, antibacterial activities against microorganism, treatment of gastro intestinal complaints, anthelmintic and antioxidants which are attributed to their active materials.

According to Burt (2004) herbs and spices are identified to exert potent antimicrobial properties in vitro against pathogens, and as alternative feeding strategy to replace antibiotic growth promoters. They been shown to offer wide range of activities, including animal performance and increasing nutrient availability when compared to organic chemicals, they present less toxicity and are free of unwanted residues and also act as supplement in animal diets (Falcao-E-Cunha et al., 2007).

Generally herbs (medicinal plants) are of leaf origin and their plants produces some chemical compounds as part of their own metabolic activities called phytochemicals. According to DalleZotte et al (2016), phytochemicals can be classified by their therapeutic values (antibacterial, antifungal, anti-inflammatory, antiulcer, antioxidant, antiviral, anticancer and immune stimulants) and preparation modes (tincture, decoction, maceration, syrup, inhalation and infusions). Medicinal plants are potential source of drugs with a promising future because there are about half million plants around the world and most of their medical activities have not yet been investigated. According to WHO (1996) around 21,000 plant species have the potential for been used as medicinal plants and are also considered to be very safe as there is no or minimal side effects. Recently, Spondiasmombin leaves have been considered very important because of their therapeutic value and several beneficial effects to human and animals especially broilers and are used as phytogenic feed additives.

Phytogenic feed are plant derived compounds added to animal's diet to improve its productivity via amelioration of feed properties, improvement of nutrient digestibility, absorption and eliminations of pathogens in the gut (Athanasiadou et al, 2007; Kamel. C, 2001). They have demonstrated antimicrobial efficacy against pathogenic bacteria such as Escheichia coli and Clostridium perfringens potentially indicating a reduced risk for the development of colibacillosis and necrotic enteritis (Mitschet al, 2004).

Spondiasmambinlinn belongs to the family Anacardiacae. It is a fructiferous tree having habitat in Nigeria, Brazil and several other tropical forest in the world (Ayokaet al, 2008), the leaves, bark and fruit juices are widely used for medicinal and non-medicinal purposes (Igweet al, 2010; Villegas et al, 1997). S. mambiaperforms several functions such as antibacterial, antifungal, antidiabetic, antitumor, anti-ulcer, antioxidant and used in the treatment of the digestive system. Pharmacological studies on the bark and leaves of the plants shows display effective antimicrobial activity (Abo et al, 1999), anti-malarial and antiviral function (Carabaloet al, 2004; Corhoutet al 1992), hypnotic and haemostatic effects (Ayokaet al, 2005; Kone-Bambaet al, 1987).

Several researches has been carried out on the effect of supplementing different medicinal plants in the diet of different livestock's most of which the results are not consistent, therefore, the objective of this study was to investigate the effects of supplementing Spondiasmombin meal in the diet of broiler chicken.

MATERIALS AND METHODS

Location of the experiment

The experiment was be carried out at the University of Abuja Teaching and Research Farm, Animal Science Section, Main Campus, along Airport Road, Gwagwalada, Abuja-Nigeria, located between latitude 8057I and 8055IN and longitude 7005I and 7006IE.

Collection and processing of test material

Mature fresh and healthy leaves of Spondiasmombin were collected from within the farm premises in the month of June, 2018. The leaves were rinsed with running tap water and air dried for 5 days. The dried leaves were grinded with a hammer mill and stored in a container. The processed S. mombin meal (SMM) were later subjected to proximate analysis as expressed in Table 3.

Animals and their management

A total of One hundred and sixty, one-day old Arbo acre broilers of mixed sex were randomly distributed into four (4) groups of 40 birds. Each group was further subdivided into 4 (four) replicates with 10 birds per each in a Completely Randomized Design. A deep litter poultry house was used; the house was cleaned and well disinfected before the commencement of the experiment. Vaccines were administered according to the prevailing vaccination schedule in the environment. Feed and water were offered ad-libitum. The light was continuous throughout the experimental period, the performance of the birds in terms of feed intake and mortality were recorded throughout the period of the experiment which lasted for 49days.

Formulation of experimental diets

The test material (SMM) was mixed with other ingredients to form four (4) experimentaldiets. Diet 1 serving as the control, diets 2, 3 and 4 had 1, 2 and 3% inclusion of SSM. The percentage composition of experimental diet is presented in Table 1 and 2. All the experimental diets were formulated to meet the nutritional requirement of birds according to NRC (1994).

Blood Analysis

At day 49, four birds were randomly selected from each replicate for blood analysis. The sampled birds were bled from punctured brachial vein to aspire 3mls of blood from each bird. Blood samples collected with Ethylene Diamine Tetra Acetate (EDTA) were used to determine Pack cell volume (PCV), heamoglobin (Hb),white blood cell counts (WBC), red blood cell count (RBC) in the sample. The PCV was determined by micro-haematocrit method (Dacie and Lewis, 1991), the haemoglobin concentration (Hb) was determined by cyanomethae-moglobin method, Red blood cell counts (RBC) were determined by Neubauerhaemocytometer method (Kelly,1979), white blood cell count (WBC) determined by Wintrobe's micro heamatocrit. The Mean corpuscular volumes (MCV), mean corpuscular haemoglobin (MCH), Mean corpuscular heamoglobin concentration (MCHC) were calculated according to Bush (1991).

Blood samples for serum were collected into bottles free from anti-coagulant and centrifuged at 1500 r.p.m for 10 minutes and the serum was separated and analyzed. Total protein, albumin, globulin, Uric acid, calcium, phosphorus, glutamic oxaloacetate transaminase (SGOT), glutamic phosphate transaminase (SGPT) level were computed according to Scott (1965), Cholesterol level were determined by Roschainet al (1974).

Chemical Analysis

Proximate analysis of diets and SMM were determined according to AOAC (2000). The phytochemical screening was determined according to procedures outlined by Harbone (1973) and Trease and Evans (1983). The mineral analysis were carried out using Atomic Absorption Spectrophotometer (AAS). Vitamin content of SSM were determined using methods as described by Ojiako and Akubugwo (1997).

Statistical Analysis

All data generated were subjected to a one way analysis of variance (ANOVA) and treatment means were compared using GLM procedures of SAS (1997). Differences among treatment means were separated by Duncan's multiple range test (Duncan, 1955).

Table 1: Percentage Composition of Broiler Starter Diet

Ingredients	Diets			
	1	2	3	4
Maize	58.00	57.00	56.00	55.00
Soya meal	30.00	30.00	30.00	30.00
Groundnut cake	6.60	6.60	6.60	6.60
Bone meal	3.00	3.00	3.00	3.00
Limestone	1.50	1.50	1.50	1.50
Lysine	0.15	0.15	0.15	0.15
Methionine	0.20	0.20	0.20	0.20
Premix	0.25	0.25	0.25	0.25
Salt	0.30	0.30	0.30	0.30
SSM	-	1.00	2.00	3.00
Total	100.0	100.0	100.0	100.0

Determined analysis

ME (Kcal/kg)	3104.5	3106.3	3106.2	3106.1
Crude protein (%)	23.68	23.64	23.61	23.63
Ether extract (%)	5.48	5.51	5.57	5.59
Crude fibre (%)	3.14	3.22	3.28	3.41

* Premix supplied per kg diet :- Vit A, 15,000 I.U; Vit E, 5mg; Vit D3, 3000I.U, Vit K, 3mg; Vit B2, 5.5mg; Niacin, 25mg ; Vit B12, 16mg ; Choline chloride, 120mg ; Mn, 5.2mg ; Zn, 25mg ; Cu, 2.6g ; Folic acid, 2mg ; Fe, 5g ; Pantothenic acid, 10mg ; Biotin, 30.5g ; Antioxidant, 56mg

Table 2: Percentage Composition of Broiler Finisher Diet

Ingredients	Diets			
	1	2	3	4
Maize	63.00	62.00	61.00	60.00
Soya meal	25.00	25.00	25.00	25.00
Groundnut cake	6.60	6.60	6.60	6.60
Bone meal	3.00	3.00	3.00	3.00
Limestone	1.50	1.50	1.50	1.50
Lysine	0.15	0.15	0.15	0.15
Methionine	0.20	0.20	0.20	0.20
Premix	0.25	0.25	0.25	0.25
Salt	0.30	0.30	0.30	0.30
SSM	-	1.00	2.00	3.00
Total	100.0	100.0	100.0	100.0

Determined analysis				
ME (Kcal/kg)	3004.9	3006.5	3006.4	3006.1
Crude protein (%)	20.68	20.64	20.61	20.63
Ether extract (%)	6.416.37	6.32	6.30	
Crude fibre (%)	3.44	3.22	3.28	3.41

* Premix supplied per kg diet :- Vit A, 8,000 I.U; Vit E, 3mg; Vit D3, 6000I.U, Vit K, 5mg; Vit B2, 5.5mg; Niacin, 25mg ; Vit B12, 16mg ; Choline chloride, 120mg ; Mn, 5.2mg ; Zn, 25mg ; Cu, 2.6g ; Folic acid, 2mg ; Fe, 5g ; Pantothenic acid, 10mg ; Biotin, 30.5g ; Antioxidant, 56mg

Table 3: Proximate composition of S. mombinleaf meal (SSM)

Parameters	% Composition
Dry matter	93.44
Crude protein	10.87
Crude ash	1.30
Ether extract	5.01
Crude fibre	10.14

Table 4: Phytochemical composition of S. mombinleaf meal (SSM)

Parameters	(%) Composition
Flavonoids	2.99
Alkaloids 4.01	
Tannins 1.79	
Saponins 5.12	
Oxalate 1.04	
Phytate1.23	

Table 5: Mineral composition of S. mombin leaf meal (SSM)

Minerals	% (mg/100g)
Copper	0.01
Iron	1.02
Zinc	0.02
Calcium	10.02
Magnesium	0.44
Potassium	7.12
Sodium	0.77
Phosphorus	0.31
Manganese	0.18
Selenium	0.43

Table 6: Vitamin composition of S. mombin leaf meal (SSM)

Minerals	% (mg/100g)
Vitamin A	6.81
Vitamin B1	0.22
Vitamin B2	1.33
Vitamin C	58.12

Table 7: The effect of supplementing different levels of S. mombinleaf meal on the performance of broiler chickens

Parameters	Diets				
	1	2	3	4	SEM
Live body weight (g)					
Initial weight	53.68	53.08	53.01	53.21	0.23
7^{th} day	117.6	117.1	117.4	118.1	0.55
28^{th} day	891.3	945.1	960.6	966.8	19.55
49^{th} day	1774.8^{c}	1903.7^{b}	2005.2^{ab}	2103.0^{ab}	31.22
Body weight gain (g)					
0-7days	63.92^{a}	64.02^{a}	64.39^{a}	64.89^{a}	9.77
7-28days	773.7^{a}	828.0^{a}	843.2^{a}	848.7^{a}	20.23
0-49days	1721.1^{c}	1850.6^{a}	1952.2^{ab}	2049.8^{a}	54.22
Feed intake (g/bird)					
0-7days	1302.44^{a}	1389.88^{a}	1378.90^{a}	1373.88^{a}	40.13
7-28days	2145.56^{c}	2103.85^{b}	2105.13^{b}	2108.13^{ab}	45.22
0-49days	3448.00^{a}	3493.73^{a}	3484.03^{a}	3482.01^{a}	102.4
Feed conversion ratio (feed/gain)					
7-28days	2.77^{a}	2.54^{b}	2.49^{a}	2.48^{b}	0.01
0-49days	2.00^{a}	1.89^{ab}	1.78^{ab}	1.66^{b}	0.06
Mortality	-	-	-	-	

^{abc} means different superscript along rows differs significantly at $P<0.05$

Table 8: The effect of supplementing different levels of S. mombin leaf meal on the hematology of broiler chickens

Parameters	Diets				
	1	2	3	4	SEM
PCV (%)	33.88^{c}	46.12^{b}	46.20^{a}	46.33^{a}	13.11
Hb (g/dl)	7.31^{b}	9.51^{b}	11.18^{ab}	11.22^{a}	0.51
RBC $\times10^{6}$(mm^{-1})	1.68^{b}	3.01^{a}	3.21^{a}	3.31^{a}	0.15
MCV (fl)	80.61	91.16	92.45	96.06	12.11
MCH (pg)	30.11	33.21	33.51	33.64	7.33
MCHC (%)	34.11	34.25	34.04	34.01	5.37
WBC $\times10^{6}$(mm^{-1})	26.12	29.91	30.22	31.07	4.10
Lymphocytes (%)	40.11	43.56	47.66	48.07	8.34
Monocytes (%)	3.04	3.37	3.42	3.63	0.35
Heterophil (%)	43.44	45.07	47.88	49.15	13.31
Basophils (%)	1.33	1.37	2.11	2.43	0.86

Eosinophils (%)	3.98	4.06	4.11	4.16	0.94

[abc] means different superscript along rows differs significantly at $P<0.05$

Table 9: The effect of supplementing different levels of S. mombin leaf meal on the hematology of broiler chickens

Parameters	Diets				
	1	2	3	4	SEM
Albumin (g/dL)	1.87	1.90	1.91	1.90	0.51
Globulin (g/dL)	1.90	1.89	1.87	1.88	0.34
Total protein (g/dL)	3.77	3.79	3.78	3.78	0.47
Albumin/globulin ratio	0.98	1.00	1.02	1.01	0.13
Uric acid (mg/L)	4.88	4.92	4.97	5.01	0.87
Calcium (mg/L)	9.78	10.1	10.3	10.6	0.22
Phosphorus (mg/L)	2.89	2.90	2.97	3.00	0.19
SGOT (U/L)	106.3	102.6	102.2	100.2	12.12
SGPT (U/L)	19.35	19.01	18.77	18.10	4.07

[abc] means different superscript along rows differs significantly at $P<0.05$
SGPT: Serum glutamic phosphatase transaminase
SGOT: Serum glutamic oxaloacetate transaminase

RESULTS AND DISCUSSION

The proximate composition of Spondiasmombin meal (SMM) is presented in Table 3. The proximate components are 93.44%, 10.87%, 5.01%, 10.14% and 1.30% for dry matter, crude protein, ether extract, crude fibre and ash respectively. This was similar to the finding of *Igwe et al* (2010) who noted that SMM contained 11.04%, 10.51%, 4.82% and 0.09% for crude protein, crude fibre, ether extract and ash respectively. Table 4 shows the phytochemical analysis of SSM, the result reveals that its chemical components are 2.99%, 4.01%, 1.79%, 5.12%, 1.04% and 1.23% for flavonoids, alkaloids, tannins, saponin, oxalate and phytate respectively which is consistent with the findings of Akubue*at al* (1983); Edeoga and Eriata (2001); Ademola*et al* (2005) and Ayoka*et al* (2005 and 2006).

According to Villegas et al (1997); Abo et al (1999); Corthout et al (1994) the leaves of Spondiasmombin are effective in the treatment of inflammatory infections and also contain 6-alkenyl salicylic acid which play a significant role in combating bacterial infections. Phenolic compounds are known to have antioxidant properties for plants (Ayoka et al, 2006). Flavonoids and tannin have also been reported for their anti-mutagenic, anti-inflammatory properties, antifungal, antidiarrheal and anti hemorrihoidial properties Tsado*et al* (2015); Asquith and Butler (1986); Rice- Evans *et al* (1997) and Wang and Lin (2000).According to Limei Chen *et al* (2007), Flavonoids are group of phenolic compounds which includes anthocyanins, catehins, flavanones, flavones, isoflavones and flavonols. Alkaloids are heterogeneous naturally occurring compounds found in the roots, leaves, seeds and bark of plants with antimicrobial properties (Adesuyi*et al*, 2011). Saponin are used as adjuvants in the production of vaccines (Asl and Hosseinzadeh, 2008)

The leaves are nutritious and contain significant quantities of vitamins (A, B and C), calcium, magnesium, copper, zinc, potassium, iron, phosphorus, manganese, sodium and selenium (Igwe*et al.*, 2010) as presented in Table 5 and 6. Mineral values obtained are 0.01, 1.02, 0.02, 10.02, 0.44, 7.12, 0.77, 0.31, 0.18 and 0.43 (mg/100g) for copper, iron, zinc, calcium, magnesium, potassium, sodium, phosphorus, manganese and selenium respectively.Heavy metals such as lead, mercury, arsenic and cadmium which are potentially toxic and deleterious to the health and performance of animals are absent from the leaves of Spondiasmombin, thus making their incorporation into poultry diet safe.

Magnesium, calcium and phosphorus plays significant role in red blood cell formation (WHO, 1992). Gupta *et al* (2014); Watts (1997) define minerals as spark plug of life and their inadequacy can lead to deficiency symptoms, for instance, iron deficiency can lead to hypochromic-microcytic anemia. Sodium deficiency can cause reduced growth, eye disturbances with corneal lesions, reproductive impairment and delayed sexual maturity in female animals.

Vitamins are organic in nature, effective in small amounts and necessary for metabolic activity but do not enter the structural components of the body (Farinu*et al*, 2005). The presence of vitamin C and other vitamins protects the body from oxidative stress and maintains the immune system. Vitamin A and B play a key role in vision, proper growth, reproduction, collagen formation and enzymatic activities.

Table 7 reveals the growth performance of birds fed diet supplemented with SMM. The final live weight of the bird ranges between 1774.8 g and 2103.0g. Birds fed diet 4 had the highest weight of 2103.0g followed by diet 3, 2 and 1 respectively. There was a significant difference ($P<0.05$) among the treatments in terms of final live weight. This was similar with the findings ofBiplobBasak*et al* (2002); and Canogullari*et al* (2010) who noted that addition of 0.4% curcuma powder to quail diet increases these parameters. Similarly, Ghazaiah and Ali (2008) reported that supplementation of Rosemary leaves (RLM) at 0.5% showed better feed conversion ratio as compared to the 0% RLM but contrary to the reports Bolu*et al* (2009) when graded levels of dried pawpaw seed was fed to broilers.

The body weight gain (BWG) values obtained are 1721.1, 1850.6, 1952.2 and 2049.8 (g) for diets 1, 2, 3 and 4 respectively while those of final feed intake are 3448.0, 3493.0, 3484.0 and 3482.01 for diets 1,2, 3 and 4. The feed conversion ratio (FCR) values obtained are 2.00, 1.89, 1.78 and 1.66 for diets 1, 2, 3 and 4 respectively. The feed intake slightly increased from diet 1 to 2 after which the values declined, there were no significant ($P>0.05$) difference among the dietary treatments. BWG and FCR were significantly ($P>0.05$) influenced by the dietary inclusion levels of SSM. This current study is in line with who reported similar results of Imasuen*et al* (2014) and Jahanzeb Ansari *et al* (2012) response of broilers to various levels of Azardirachtaindica dried leaf meal in diets. In contrast, Yakubu*et al* (2017) noted non-significant results on total feed intake and average feed intake of broilers fed Cassia obtusifolia leaf meal.

Table 8 shows the hematological parameters of broilers fed different levels of SSM. The PCV values obtained are 33.88%, 46.12%, 46.20% and 46.33% for diets 1, 2, 3 and 4 respectively while those of Hemoglobin (Hb) are 7.31, 9.51, 11.18 and 3.31 (g/dl) for diets 1, 2, 3 and 4 respectively. The Red blood cell (RBC) values obtained are 1.68, 3.01, 3.21 and 3.31 (10^6/mm) for diets 1, 2, 3 and 4 respectively while those of MCV are 80.61, 91.16, 92.45 and 96.06 (f/l) for diets 1, 2, 3 and 4 respectively. The PCV, Hb, RBC values increased from diet 1 to 4 and were significantly influenced ($P>0.05$) influenced by the dietary inclusion of SSM, however, all values fall within the range reported by Campbell. T.W (2013); IbrahimAlbokhadaim (2012) and

Talebi*et al* (2005) on the Hematological values of broiler chicken. Togun*et al* (2007) reported that when hematological parameters fall within the range for an animal, it is a clear picture that the diet (test material) does not show any adverse effect on the blood profile of the animals during the experimental period, but when they fall below normal range, it is a sign of anemiaor harmful effects of high dietary contents especially in parameters like Hb, PCV and RBC.A PCV less than 35% is a sign of anaemia and a PCV greater than 55% is suggestive of dehydration or polycythemia (NseAbasi n. Etim, 2014), it is also involved in the transport of oxygen and absorbed nutrients.

According to Merck manual (2012); Onyeyili*et al* (1991) hematological studies are used to investigate the numbers and morphology of the cellular elements of the blood. They are also clear indicators to disease prognosis and feed stress monitoring Togun and Oseni (2005); Hauptmanova*et al* (2006); Quintavalla*et al* (2001) and Abdi-Hachesoo*et al* (2011). They are medium for measurements of potential biomarkers, because its collection is relatively non-invasive and it encompasses an enormous range of physiological process in the body at any given time (Garacyk*et al* 2003).

The MCH values obtained are 30.11, 33.21, 33.51 and 33.64 (pg) for diets 1, 2, 3 and 4 respectively while those of MCHC are 34.11, 34.25, 34.04 and 34.01 (%) for diets 1, 2, 3 and 4. The WBC values obtained are 26.12, 29.19, 30.22 and 31.07 (10^6/mm) for diets 1, 2, 3 and 4 respectively while those of lymphocytes (%) are 40.11, 43.56, 47.66 and 48.07 for diets 1, 2, 3 and 4. The MCH and MCHC values were not significantly affected (P>0.05) by the dietary inclusion of SSM. The values indicates that the animals are well nourished.

The WBC values obtained are 26.12, 29.12, 30.22 and 31.07 (10^6/mm) for diets 1, 2, 3 and 4 respectively while those of lymphocytes are 40.11, 43.56, 47.66 and 48.07 (%) for diets 1, 2, 3 and 4. The heterophil values obtained are 43.44, 45.07, 47.88 and 49.15 (%) for diets 1, 2, 3 and 4. According to Ameen *et al* (2007) when the WBC, lymphocytes and neutrophils falls within the normal range, it shows that the feeding pattern do not affect the immune system. Neutrophils, lymphocytes, basophils and eosinophils play a key role in phagocytosis and bactericidal (Herawati, 2010), increase in neutrophil and lymphocytes ratio is a sign of nutritional stress (Etim*et al*, 2014; Adenkola*et al*, 2008). Animals with low WBC are expose to high risk of infection, while those with high counts are capable of generating antibodies in the process of phagocytosis and have high degree of resistance to diseases (Isaac *et al*, 2013; Soetan*et al*, 2013;Iwuji and Herbert, 2012)

As presented in Table 9, the present findings indicate that the total protein values are 3.77, 3.79, 3.78 and 3.78 (g/dl) for diets 1, 2, 3 and 4 respectively while those of albumin are 1.87, 1.90, 1.91 and 1.90 (g/dl) for diets 1, 2, 3 and 4 respectively. The globulin values obtained are 1.90, 1.89, 1.87 and 1.88 (g/dl) for diets 1, 2, 3 and 4 respectively while those of uric acid (mg/L) are 4.48, 4.92, 4.97 and 5.01 for diets 1, 2, 3 and 4. The total protein, albumin and uric acid were not significantly (P>0.05) different among the dietary treatment. This finding is in agreement with the reports of Simaraks*et al* (2004) but contrary to the reports of Arkan B. Mohamed (2012) on the effect of ginger on the performance and blood serum parameters of broiler. This results simply shows that the protein in the diets is enough to support the growth and development across the treatments. The calcium ion values are 9.78, 10.1, 10.3 and 10.6 (mg/L) for diets 1, 2, 3 and 4 respectively while those of phosphorus ion are 2.89, 2.90, 2.97 and 3.00 respectively. The SGOT values obtained are 106.3, 102.6, 102.2 and 100.2 (u/l) for diets 1, 2, 3 and 4 respectively while those of SGPT values are 19.35, 19.10, 18.77 and 18.10 (u/l) for diets 1, 2, 3 and 4 respectively.

CONCLUSION

The results obtained from this study clearly demonstrated that Spondiasmombin meal (SMM) could be efficiently utilized and tolerated by broiler chickens up to 3.0% inclusion level without any deleterious effect on performance and health status of the birds.

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