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Effect of Sesamum indicum leaves on growth performance and carcass characteristics of broiler chicken

***Adedeji, O.S[1]., Amao, S.R[2]. and Olugbemiga, K. S.[1]**

[1]Department of Animal Nutrition and Biotechnology, Ladoke Akintola University of Technology, P.M.B. 4000, Ogbomoso, Oyo State, Nigeria
[2]Department of Agricultural Education (Animal Science Division; Animal Breeding and Genetics Unit), School of Vocational and Technical Education, P.M.B.1010, Emmanuel Alayande College of Education, Oyo, Oyo State, Nigeria.

****Corresponding Author:*** osadedeji@lautech.edu.ng

Target Audience*:* Researchers, Animal Nutritionists, Livestock keepers

Abstract

The study was conducted to determine the effect of Sesamum indicum leaves on growth performances, carcass characteristics, primal cuts and organs' weights of broiler chicken fed from day old to eight weeks. A total of 150 broiler chicks were partitioned into 5 treatments, where each treatment had 3 replicates with 10 birds per replicate and grinded-air dried leaves of Sesamum indicum leaves were administered into their feed. Treatment I (T1) served as control containing 0 % of Sesamum indicum leaves, treatments II (T2), III (T3), IV (T4) and V (T5) were given 10 g, 20 g, 30 g and 40 g per kg of feed, respectively. As animals were housed under identical condition of temperature and humidity while feed and water was made available ad-libitum. Also, necessary vaccinations and medications were administered to the group I birds. The experiment lasted 8 weeks. At the end of 4 and 8 weeks respectively, data were obtained for total feed intake, weight gain, feed conversion ratio of the birds and also, carcass evaluation were carried out on random sample of birds from each replicate. Results indicated that growth performances, carcass characteristics, primal cuts and organs' weights were significantly (P< 0.05) affected most of the parameters measured. The inclusion of Sesamum indicum leaves into broiler diet at 10g/kg treatment had almost the similar body weight, improvement in weekly gain in weight and feed efficiency and carcass assessment as compared to that of control group of broilers.

Keywords: *Sesamum indicum* leaves, broiler chicken, growth performance, carcass characteristics

Description of Problem

Poultry production in Nigeria is one of the major popular enterprises that serve as source of animal protein to the ever growing Nigerian populace for contributing significantly to human nutrition and economic development (1). The poultry industry is known to be contributing more than 75 % of the total livestock production in Nigeria (2). Proper feeding has a great effect in poultry growth, production as well as meat quality. These situations of cost and proper feeding have created the need to look for cheap, locally available and less competitive source of protein rich in lysine, an essential amino acid required for the normal and proper utilization of feed by broiler chicken. Recently, the use of leguminous multipurpose trees and shrubs has

been suggested to be a viable alternative source of lysine, methionine, vitamins and minerals for poultry feeding (3).

Sesame (*Sesamum indicum* L.) seeds have been grown in tropical regions throughout the world since prehistoric times. Sesame seed, a rich source of protein, is one of the first crops processed for oil production. Its non-culinary application includes its use as an ingredient in soap, cosmetics, lubricants and medicines. Sesame seeds also contain two unique substances: sesamin and sesamolin known to have a cholesterol lowering effect in humans and to prevent high blood pressure. The antibacterial activity of sesame against *Staphylococcus* and *Streptococcus* as well as common skin fungi, such as athlete's foot fungus has also been well recognized (4).

Sesamum indicum is a good source of lysine and methionine and are natural amino acid sources compared to the synthetic lysine and methionine (5). Sesame is an herbaceous plant growing up to 15m high, it has purple, pink or white flower and fruits are cotton capsule which contain several seeds from 2-5mm long. It contains protein rich in lysine, methionine, leucine and arginine (6). Various types of feed additives have been evaluated under commercial conditions and in experimental trials with the objective to achieve improvements on growth performance and the best economic return (7). Some of the alternatives that have been studied include herbs, spices and various plant extracts/essential oils, probiotics or direct fed microbials (8), prebiotics (9), synbiotics (10), organic acids, and dietary enzymes (9, 11). The objective of the study was to evaluate the effect of a non-synthetic growth promoter, *Sesamum indicum* leaves as a feed additive alternating the use of the synthetic antibiotics, on growth performance and carcass characteristic of broiler chickens at 8 weeks of age.

Materials and Method

Experimental Site

The study was carried out at the Poultry Unit of Teaching and Research Farm, Ladoke Akintola University of Technology, Ogbomoso, Oyo State.

Preparation and Collection of Test Ingredient

The *Sesame indicum* plants used for the experiment were planted at the Arable Unit of Teaching and Research Farm, Ladoke Akintola University of Technology, Ogbomoso. They were air dried and ground into powdery form.

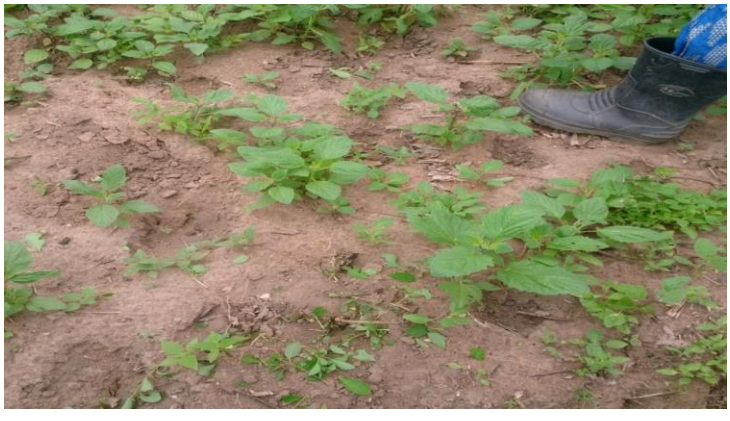

Plate 1: Excerpt from the field, showing the newly germinated *Sesamum indicum* plants.

Plate 2: Full grown leaves of *Sesamum indicum*

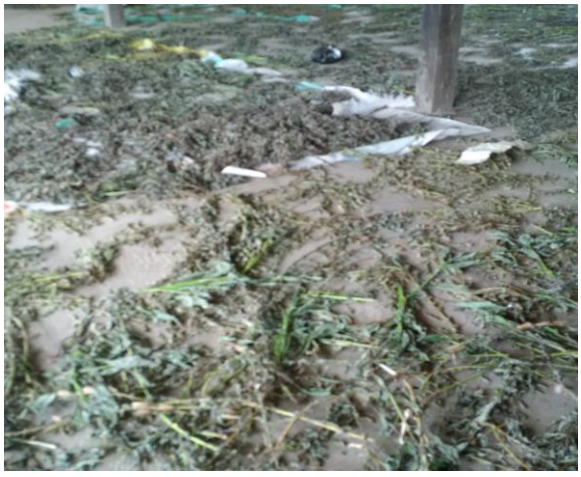

Plate 3: Air-drying process of the *Sesame indicum* leaves

Experimental Animal and Management

A total number of 150 (Marshall) day old broiler chicks were sourced from Zartech Farms, Ibadan. Prior to the arrival of the chicks, the pens were clean and disinfected with Morigad Lysol disinfectant. The birds was randomly divided into five (5) treatments, each treatment consisted of three (3) replicates consisting of 10 birds per replicate. The birds were subjected to a fifty six (56) days adequate brooding process

Experimental Diets

Broiler starter feed contained 22.87 % crude protein and 2987kcal/kg metabolizable energy while broiler finisher feed was 20.94 % crude protein and 2813kcal/kg metabolizable energy. *Sesamum indicum* leaves were added to both broiler starter and finisher. Treatment I (T1) served as control containing 0 % of *Sesamum indicum* leaves, treatments II (T2), III (T3), IV (T4) and V (T5) were given 10 grams, 20 grams, 30 grams and 40 grams per kilogram of feed respectively. All animals were housed under identical conditions of temperature and humidity while feed and water was made available *ad-libitum.* Also, necessary vaccinations and medications were administered to the Treatment I birds. The composition of the experimental diets is indicated in Table 1.

Data Collection

Growth performance characteristics

At the end of 4 and 8 weeks respectively, data were recorded for total body weight (g), feed intake (g), weight gain (g), feed conversion ratio of the birds using the procedures of (12). The birds were weighed at the end first day to obtained initial weight and also at 4 and 8 weeks obtain their final body weights. The weekly average body weight gain of birds was obtained by difference between previous week average body weight and the present week average body weight. Feed consumption was obtained by the feed left over subtracted from feed given and the value divided by total number of birds daily while feed conversion ratio was obtained by the ratio of daily feed intake to weight gain within each measurement period on weekly basis during the whole experiment.

Carcass Characteristics

Forty five (45) birds comprises of three (3) birds per replicate from each treatments were randomly selected at the end of the of 4th weeks (starter phase) while the similar number

per replicate per treatment were also randomly selected at the end experiment (8 weeks-finisher phase) totally ninety (90) birds and the carcass characteristics were determined by starving the birds selected of feed overnight and individually weighed to obtain starved live body weight. The birds were stunned and bled by severing the blood vessels and the nerve trunks at the roof of the mouth with a sticking knife. Thereafter the birds were scalded, deplumed manually and eviscerated through a slit made between the end of the keel bone and rectum. The live weight, bled weight, eviscerated weight, dressing weight, carcass weight (carcass characteristic), head weight, neck weight, breast weight, thigh weight, wing weight, drumstick weight, shank weight and back weight (primal cuts) were recorded. The organ weights observed were whole gastro intestinal tract, whole gizzard, empty gizzard, kidney, heart, liver, spleen, lung, proventiculus and abdominal fat. The parameters were measured as described by (12).

Statistical Analysis

All data obtained were subjected to analysis of variance using (13) with the means compared using the Duncan's Multiple Range Tests (14).

Results and Discussion

Growth performance

There were significant ($P < 0.05$) variations in growth performance indices measured in response to *Sesamum indicum* fed to the broilers in Table 2. The results obtained indicated that final weight (FW) and weight gain (WG) decreased significantly with increasing levels of *Sesamum indicum* inclusions in the diets in this order T1 > T2 > T3 > T4 and T5. This decrease in the observable FW and WG parameters was consistent with the reports of (15) who claimed diminishing values of both FW and WG in broiler chickens fed black sesame seed meal as replacement for methionine. Average feed intake (AFI) decreases with increasing *S. indicum* leaf meal from 10 g – 40 g inclusions level. The lower feed intake observed in this study could be attributed to the presence of phytic and oxalic acid content of sesame (16). Also, the decreased in values of these variables across the dietary treatment indicated that the *Sesamum indicum* was not acceptable in the diets due to its bitter taste and high amount of oil (17). This could also be linked to the anti-nutritional factors contained in the seed as earlier remarked (18). However, the feed conversion ratio (FCR) is an important index of performance which is a direct indication of how best feed offered to birds was utilized for meat production. The lower the FCR value, the better the feed utilization, birds with higher FCR value had suppressed growth. The FCR at week 8 increased for the birds fed *S. indicum* across dietary treatments which were in line with the earlier findings of (19) for broilers fed sesame seed meal. This study revealed that birds on T5 (40 g of *S. indicum*) (1.49) at week 4 and T2 (10 g of *S. indicum*) (2.07) at week 8 utilized the nutrients in the feed compared to the other treatments. The present results of differences in the growth performance parameters were not in line with the findings of (20) who reported non-significant effect on growth performance of broiler chickens fed both *S. indicum* and drumstick leaves as sources of lysine. There were significant variations in all the performance criteria which might be due to higher levels of *Saseum indicum* in the diet. Poor performance was attributed to the latter, in addition to the poor amino acids quality in *S. indicum*. The growth performance displayed by broiler chickens on diet T2 showed that the inclusion level must not be more than this level and such observations were in accordance with the findings of (21) that sundried *S. indicum* could be due to high residue of anti-nutritional factors (ANFs). Their results revealed that of

all the processing methods studied, the level of ANFs was highest in the sundried sample while oxalates have been reported to form complexes with mineral particularly calcium thereby making them unavailable to the body, cause irritation of the gut and resulting in low feed intake, inhibit protein and energy utilisation in broilers (22).

Carcass Characteristics

Significant ($p<0.05$) effect of sesame leaf meal on carcass characteristics of broilers chickens at both phases (4 and 8 weeks) is presented in Table 3, The significant variations recorded in live weight (LW), bleed weight (BW), eviscerated weight (EW), defeathered weight (DW) and carcass weight (CW) were in agreement with the findings of (21) that broiler chickens fed different treated *S. indicum* showed different responses in respect to carcass characteristics. However, the result on carcass characteristic disagreed with the reports of (15) who they found that carcass parameters were similar with increased level (non- significant effect) of toasted white sesame seed meal.

There were significant ($P<0.05$) difference among primal cuts of broilers chicken fed *Sesamum indicum* leaf meals as shown in Table 4. The results indicated that broiler chickens fed 10g inclusion of *S. indicum* leaves meal (T2) were superior in respect to neck, shank, thigh, drumstick and breast weights than other broiler chickens on diets T1, T3, T4 and T5. This present results on primal cuts were in line with the study of (20) who claimed that broiler chicken would performed better in terms of cut up parts when fed little among of *S. indicum* leaves of about 6 %. Also, the findings of (23) supported the current study that small amount of *S. indicum* additive gives better results in terms of primal cut parts of broiler chickens. However, the significant variation obtained in the primal cut of the broiler chickens were not in line with the findings of (24) that concluded non-significant difference in the primal cut of broiler chicken fed diets containing varied levels of *S. indicum* meal.

Significant ($P < 0.05$) effect of sesamum leaf meal on organ weights was revealed in Table 4. The results indicated that whole gastro intestinal tract, whole gizzard, empty gizzard, liver and abdominal fat were significantly affected by the dietary treatments while other organs weighted were non-significant ($P > 0.05$) across the tested diets The current results on non- significant effect of *S. indicum* on the organ weights agreed with the work of (24). The authors claimed that broiler chickens fed different diets of *S. indicum* showed no variation in terms of their visceral organs. The variations recorded along the organ weight presently were in line with the reports of (25) who reported that high dietary fat contain of sesame seed could lead to excess deposition of adipose tissue. The fact that other internal organs showed non-significant effect on their respective weight indicated that the sesame leaf meal could not attain any appreciable toxins that could be detrimental to the organ.

Conclusion and Application

In this research work:

1. The inclusion of *Sesamum indicum* into broiler diet at 10g/kg treatment has almost the same body weight and improvement in weekly weight gain and feed efficiency as compared to that of control group of broilers.
2. Sesame leaf could be incorporated up to 10% in the diets of broiler chickens without any adverse effect on performance, carcass characteristics both at starter and finisher phases.

Table 1: Gross composition of experimental diets (starter and finisher phases)

	Starter Phase					Finisher Phase				
Ingredients	**T1 (g/kg)**	**T2 (g/kg)**	**T3 (g/kg)**	**T4 (g/kg)**	**T5 (g/kg)**	**T1 (g/kg)**	**T2 (g/kg)**	**T3 (g/kg)**	**T4 (g/kg)**	**T5 (g/kg)**
Maize	53	53	53	53	53	45	45	45	45	45
Soybean meal	34	34	34	34	34	23	23	23	23	23
Wheat offal	-	-	-	-	-	3.5	3.5	3.5	3.5	3.5
Corn meal	5	5	5	5	5	11.2	11.2	11.2	11.2	11.2
Fish meal	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
GNC	2	2	2	2	2	5	5	5	5	5
PKC	-	-	-	-	-	4.5	4.5	4.5	4.5	4.5
Limestone	1	1	1	1	1	1.5	1.5	1.5	1.5	1.5
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Bone meal	1.5	1.5	1.5	1.5	1.5	3	3	3	3	3
Lysine	0.25	0.25	0.25	0.25	0.25	0.12	0.12	0.12	0.12	0.12
Methionine	0.25	0.25	0.25	0.25	0.25	0.18	0.18	0.18	0.18	0.18
Premix	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Sesamum indicum	0	0.1	0.2	0.3	0.4	0	0.1	0.2	0.3	0.4
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Calculated Analysis										
M.E	2987.32	2987.32	2987.32	2987.32	2987.32	2813.13	2813.13	2813.13	2813.13	2813.13
	22.87	22.87	22.87	22.87	22.87	20.94	20.94	20.94	20.94	20.94
CP										
	4.00	4.00	4.00	4.00	4.00	4.85	4.85	4.85	4.85	4.85
CF										
	3.68	3.68	3.68	3.68	3.68	3.72	3.72	3.72	3.72	3.72
Crude fat										
	1.48	1.48	1.48	1.48	1.48	1.15	1.15	1.15	1.15	1.15
Lysine										
	0.60	0.60	0.60	0.60	0.60	0.50	0.50	0.50	0.50	0.50
Methionine										
	1.04	1.04	1.04	1.04	1.04	1.66	1.66	1.66	1.66	1.66
Calcium										
	0.61	0.61	0.61	0.61	0.61	0.83	0.83	0.83	0.83	0.83
Phosphorus										

T1 (g/kg) = diet without *S. indicum,* T2 (g/kg) = diet with 10g of *S. indicum,* T3 (g/kg) = diet with 20g of *S. indicum*, T4 (g/kg) = diet with 30g of *S. indicum,* T5 (g/kg) = diet with 40g of *S. indicum.* SEM = Standard error of means

M.E = Metabolizable energy, CP = Crude protein. CF = Crude Fibre

Table 2: Growth performance of broiler chickens fed varying inclusion of *S. indicum*

Parameters	T_1 0 (g)	T_2 10 (g)	T_2 20 (g)	T_3 30 (g)	T_4 40 (g)	SEM
Starter Phase						
Initial weight (g)	46.13	45.20	45.73	46.07	44.93	0.28
Final weight (g)	858.07^{a}	902.37^{a}	734.90^{b}	718.27^{b}	582.53^{c}	31.70
Total weight gain (g)	811.93^{a}	857.17^{a}	689.17^{b}	672.20^{b}	537.60^{c}	31.63
Total feed intake (g)	360.00^{b}	395.33^{a}	367.67^{b}	387.67^{ab}	361.00^{b}	4.97
Feed : gain ratio	2.26^{a}	2.17^{a}	1.87^{b}	1.74^{b}	1.49^{c}	0.18
Finisher Phase						
Initial weight (g)	858.07^{a}	902.37^{a}	734.90^{b}	718.27^{b}	582.53^{c}	31.70
Final weight (g)	2313.67^{ab}	2498.33^{a}	2098.33^{ab}	1924.33^{bc}	1668.33^{c}	91.80
Total weight gain (g)	1455.60^{ab}	1595.97^{a}	1363.43^{ab}	1206.07^{ab}	1085.80^{b}	66.44
Total feed intake (g)	3164.70^{b}	3245.90^{a}	3133.53^{b}	2912.57^{c}	2731.73^{d}	33.44
Feed : gain ratio	2.17^{ab}	2.07^{b}	2.29^{ab}	2.42^{ab}	2.56^{a}	0.23

^{abc}Means with different superscripts along the same row are significantly (P<0.05) different
T1 0 (g) = diet without *S. indicum*, T2 10 (g) = diet with 10g of *S. indicum*, T3 20 (g) = diet with 20g of *S. indicum*, T4 30 (g) = diet with 30g of *S. indicum*, T5 40 (g) = diet with 40g of *S. indicum.* SEM = Standard error of means

Table 3: *Sesamum indicum* responses on carcass characteristics of broiler chicken at starter and finisher phases

Parameter (g)	T_1 0 (g)	T_2 10(g)	T_3 20(g)	T_4 30(g)	T_5 40(g)	SEM
Starter Phase						
LW	1019.25^{a}	986.00^{ab}	952.75^{bc}	893.50^{c}	736.00^{d}	14.70
BW	95.74^{a}	94.58^{d}	94.95^{c}	95.14^{b}	95.49^{ab}	0.40
EW	70.24^{bc}	73.67^{a}	71.43^{b}	70.23^{bc}	69.53^{c}	3.90
DW	66.87^{b}	69.88^{a}	66.62^{b}	66.10^{b}	65.67^{b}	2.07
CW	55.87^{b}	58.50^{a}	56.21^{b}	54.89^{b}	54.84^{b}	3.02
Finisher Phase						
LW	2784.25^{a}	2522.00^{b}	2484.50^{b}	2243.25^{c}	2279.00^{c}	30.75
BW	94.00^{ab}	93.31^{b}	94.32^{a}	93.20^{b}	93.38^{ab}	14.00
EW	81.93^{a}	78.68^{b}	78.04^{b}	79.09^{b}	77.42^{c}	0.19
DW	79.86^{a}	78.89^{a}	76.79^{b}	79.60^{a}	75.51^{b}	13.00
CW	74.26^{a}	72.83^{ab}	71.84^{b}	69.64^{c}	67.29^{d}	0.78

^{abcd}Means with different superscripts along the same row are significantly (P<0.05) different
LW = Live weight (g), BW = Bled weight (g), EW = Eviscerated weight (g), DW = Dressing weight (g), Carcass weight (g), T1 0 (g) = diet without *S. indicum*, T2 10 (g) = diet with 10g of *S. indicum*, T3 20 (g) = diet with 20g of *S. indicum*, T4 30 (g) = diet with 30g of *S. indicum*, T5 40 (g) = diet with 40g of *S. indicum.* SEM = Standard error of means

Table 4: *Sesamum indicum* response on primal cuts of broiler chicken at starter and finisher phases

Parameter (g)	T_1 0 (g)	T_2 10 (g)	T_3 20 (g)	T_4 30 (g)	T_5 40 (g)	SEM
Starter Phase						
Head	2.70^{c}	2.97^{b}	2.71^{c}	2.73^{c}	3.16^{a}	0.09
Neck	3.98^{c}	4.58^{a}	4.27^{ab}	3.21^{d}	3.65^{c}	3.10
Shank	4.34^{d}	4.90^{a}	4.60^{b}	4.14^{d}	4.54^{bc}	2.14
Thigh	9.24^{b}	10.52^{a}	9.38^{ab}	10.49^{a}	10.42^{a}	0.03
Drumstick	8.63^{a}	8.49^{ab}	8.50^{ab}	7.60^{c}	7.72^{bc}	1.08
Breast	17.97^{bc}	19.58^{a}	17.25^{c}	18.28^{b}	17.19^{c}	0.04
Back	11.57	11.39	11.36	10.73	10.51	0.12
Wing	8.20^{b}	8.33^{b}	8.30^{b}	8.82^{a}	8.94^{a}	0.32
Finisher Phase						
Head	2.15^{c}	2.25^{bc}	2.40^{a}	2.25^{bc}	2.30^{b}	0.91
Neck	5.36^{a}	4.22^{b}	5.15^{a}	5.28^{a}	8.22^{c}	1.23
Shank	4.11^{c}	4.18^{bc}	5.15^{a}	5.15^{a}	4.60^{b}	1.09
Thigh	10.61^{b}	11.70^{a}	11.51^{a}	11.51^{a}	11.69^{a}	0.02
Drumstick	11.45^{a}	10.93^{b}	10.65^{b}	10.64^{b}	10.92^{b}	0.12
Breast	21.89^{a}	20.85^{b}	20.00^{c}	11.51^{a}	11.51^{a}	0.80
Back	21.89^{a}	13.63^{a}	20.00^{c}	13.42^{a}	12.40^{b}	0.63
Wing	8.61^{a}	13.63^{a}	20.00^{c}	8.50^{ab}	12.40^{b}	0.11

^{abc}Means with different superscripts along the same row are significantly ($P<0.05$) different
T1 0 (g) = diet without *S. indicum*, T2 10 (g) = diet with 10g of *S. indicum*, T3 20 (g) = diet with 20g of *S. indicum*, T4 30 (g) = diet with 30g of *S. indicum*, T5 40 (g) = diet with 40g of *S. indicum.*
SEM = Standard error of means

Table 5: *Sesamum indicum* on organ weights of broiler chicken at starter and finisher phases

Parameter	T_1 0 (g)	T_2 10 (g)	T_3 20 (g)	T_4 30 (g)	T_5 40 (g)	SEM
Starter Phase						
GIT	11.21^{c}	12.71^{a}	13.33^{a}	12.45^{b}	13.35^{a}	0.12
Whole gizzard	2.72^{b}	2.80^{a}	2.69^{b}	2.77^{ab}	2.70^{b}	0.30
Empty gizzard	1.71^{ab}	1.79^{a}	1.73^{a}	1.75^{a}	1.58^{b}	1.10
Kidney	0.34	0.37	0.41	0.44	0.42	0.11
Abdominal fat	0.70	0.38	0.66	0.74	0.66	0.01
Liver	1.90^{a}	1.95^{a}	2.06^{a}	1.61^{b}	2.05^{a}	0.20
Spleen	0.08	0.11	0.08	0.53	0.09	0.17
Lung	0.42	0.39	0.42	0.40	0.42	0.02
Proventiculus	0.54	0.46	0.51	0.44	0.46	0.33
Heart	0.40	0.41	0.43	0.41	0.42	0.07
Pancrease	0.28	0.26	0.28	0.28	0.32	0.19
Finisher Phase						
GIT	18.93^{b}	17.18^{c}	18.65^{b}	19.19^{b}	20.40^{a}	0.22
Whole gizzard	3.44^{c}	3.65^{c}	3.62^{c}	4.21^{a}	3.92^{b}	1.00
Empty gizzard	2.07^{b}	2.28^{a}	2.11^{b}	2.40^{a}	2.41^{a}	0.11
Kidney	0.31	0.33	0.31	0.30	0.31	0.31
Abdominal fat	0.81^{a}	0.77^{ab}	0.85^{a}	0.37^{c}	0.53^{b}	0.18
Liver	2.48^{a}	2.55^{a}	1.82^{b}	2.54^{a}	2.09^{ab}	0.04
Spleen	0.09	0.10	0.11	0.10	0.13	1.22
Lung	0.44	0.48	0.29	0.53	0.46	0.12
Proventiculus	0.52	0.61	0.49	0.61	0.57	0.11
Heart	0.46	0.40	0.36	0.42	0.41	0.40
Pancrease	0.34	0.33	0.32	0.31	0.33	0.01

^{abc}Means with different superscripts along the same row are significantly ($P<0.05$) different
GIT = Gastro intestinal Tract, T1 0 (g) = diet without *S. indicum*, T2 10 (g) = diet with 10g of *S. indicum*, T3 20 (g) = diet with 20g of *S. indicum*, T4 30 (g) = diet with 30g of *S. indicum*, T5 40 (g) = diet with 40g of *S. indicum.*
SEM = Standard error of means

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