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Blood Profile and Carcass Traits of West African Dwarf Goat Fed Diet Containing LAB-Fermented Jatropha Kernel Cake

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ABSTRACT

This study examined the effect of Jatropha kernel cake fermented with different strains of lactic acid bacteria on the blood profile and carcass traits of WAD goats. For this, five concentrate feed mixtures containing soya bean cake were replaced with LAB-fermented Jatropha kernel cake (FJKC). Fifty WAD bucks were used for this experiment; the bucks were assigned to 5 dietary treatments. Each had 5 replicates of 2 bucks following a completely randomised design of a one-way analysis of variance. The five experimental diets were composed of control (diet A); 0% FJKC, (B) 10 % L. acidophilus DLB07 FJKC, (C); 10% L. plantarum DLB13 FJKC, (D); 10% L. rhamnosus DLB23 FJKC and (E); 10% Co-culture fermentation of three LAB strains inclusion in the basal diet. The bucks were fed the experimental diets for 98 days. On the last day of the experiment, data were collected on haematological and serum biochemical parameters, as well as carcass traits. The result showed that the red blood cell (RBC), white blood cell (WBC) counts, and the neutrophils were significantly ($p \leq 0.05$) different among the treatments. The serum biochemical parameters showed significance ($p \leq 0.05$) in all the parameters except the Alanine Aminotransferase (ALT). while the carcass traits were similar across the groups. It is concluded that 10% FJKM of the selected strains either singly or in cocktail could potentially be used as replacement for soybean meal up to 10% inclusion in WAD buck diets as it reflects no deleterious effect on the optimal physiological status of the animal.

INTRODUCTION

Goat meat plays a crucial role in dietary protein supply for food security. However, sustainable goat production requires adequate nutritional management to optimise their productivity and production cost (Luginbuhl, 2020; Ganiyu *et al*., 2025). Inadequate nutrition and toxic feed predispose the animal to diseases, reduce the feed conversion ratio, and poor carcass yield (Gawat *et al*., 2023).

Sustainable goat meat production hinges on the use of non-conventional feedstuffs such as oilseed residues. These by-products provide adequate alternative protein sources for livestock feeding (Belewu *et al*., 2013). The Jatropha seed and kernel cakes and meals from biodiesel production are useful non-conventional feed alternatives that have been gaining acceptability owing to their rich nutrient contents (Antyev, 2018; de Barros *et al*., 2024). Jatropha kernel cake is a protein-rich by-product obtained after oil extraction from Jatropha curcas seeds, typically containing high crude protein levels ranging from about 28% up to over 50% in untreated and treated forms (Belewu *et al*., 2010; Gniyu and Belewu, 2024; Ogunsola *et al*., 2024). Jatropha kernel cake can offer comparable essential amino acid profiles to conventional protein sources and serve as a sustainable alternative protein source in ruminant nutrition (Zhao *et al*., 2024). Although, their use is limited due to their toxic nature. Thus, a number of techniques have been explored to eliminate the antinutrient contents with reasonable hallmarks (Gomes, 2018; de Barros *et al*., 2024).

The effect of the feedstuff on blood constituents can be used to assess the safety of the feed in the animal (Kim, 2023). Blood is a vital tool that help to detect any deviation from normal physiological function in the animal or human body. Haematology such as white blood cells (WBCs), red blood cells (RBCs), haemoglobin (Hb), Platelets (PLTs) and packed cell volume (PCV) among others assist in arriving at a definitive diagnosis of a disease, nutritional status and help to make a prognosis and also to assess the efficiency of therapy and toxicity of drugs incorporated at different levels into the experimental and chemical substances (Etim *et al*., 2014; Merder *et al*., 2020).

Haematological and biochemical observations would substantiate the physical examination in determining the health status of the animals since it has been well documented for various livestock (Donia *et al*., 2018). Fazio (2019), reported serum biochemistry and hematological analyses as the important and reliable means for monitoring the health status of an animal and may also indicate the degree of damage to the host tissue and severity of infection.

Haematological and biochemical parameters vary between goat breeds and there is no universally established metabolic profile test for goats (Muayad *et al*., 2018; Antunović *et al*., 2022). Belewu *et al*. (2011) and Kasuyi *et al*. (2013) found that fungi treated Jatropha seed cake have no negative effective on the blood parameters

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of goats. However, information on blood parameters and carcass yield of goats offered feed containing lactic acid bacteria fermented Jatropha kernel meal is still scanty. Therefore, this study will provide information on the blood profile and carcass traits of the West African Dwarf goat fed a lactic acid bacteria strains fermented Jatropha kernel cake-based diet.

MATERIALS AND METHODS

Location of Experiment

The experiment was conducted at the Small Ruminant Unit of the Teaching and Research Farm, Kwara State University, Malete, Nigeria. The study location lies within the Southern Guinea Savannah agro-ecological zone of Nigeria, positioned at latitude 08°71'N and longitude 04°44'E.

Collection and Inoculation of the Substrate

The defatted Jatropha kernel meal were obtained from the Jatropha Biodiesel Plant, University of Ilorin, Ilorin, Nigeria. This was followed by cold extraction using petroleum ether. The defatted kernel cake was autoclaved at 121°C for 15 minutes to get rid of any microbial contaminants that could be present in the cake (Belewu, 2010).

Strains of LAB, namely: Lactiplantibacillus plantarum DLB13, Lactobacillus acidophilus DLB07, and Lactobacillus rhamnosus DLB23, were obtained from the National Microbiological Centre, Abuja, Nigeria. The bacteria were used singly and as a co-culture, which was composed of Lactiplantibacillus plantarum DLB13, Lactobacillus acidophilus DLB07, and Lactobacillus rhamnosus DLB23 at equal ratio (1:1:1). The LABs were isolated by streaking on MacConkey de-Man, Rogosa and Sharpe (MRS) agar (Pcode102102603) plates, which were incubated at 30 °C for 48 hrs.

The cooled autoclaved kernel meal contained in Petri dishes was inoculated each with the lactic acid bacteria (L. plantarum DLB13, L. acidophilus DLB07, L. rhamnosus DLB23 and the co-culture of the three bacteria), while the control experiment was not inoculated with LAB. The autoclaved J. curcas kernel substrate was inoculated with each bacterial strain at 1.0×10^6 CFU per gram of substrate. After inoculation, the samples were incubated with each inoculum to colonise the substrate for 7 days at 30°C, after the bacteria could have enveloped the media. The fermented substrates were oven-dried at 70°C to terminate the bacterial growth.

Experimental Diets

The diets were composed of T1; 0% Jatropha Kernel Cake, T2; 10% L. acidophilus DLB07 inoculated Jatropha Seed Kernel Cake, T3;10% L. plantarum DLB13 inoculated Jatropha Seed Kernel Cake, T4; 10% L. rhamnosus DLB23 inoculated Jatropha Seed Kernel Cake, T5; 10% mixture of the bacteria (co-culture of Lactobacillus spp in T2, T3 and T4) treated JSKC (Table 1).

Table 1: Gross composition of Experimental Diets

Items	**Treatments**				
Ingredients (%)	**A**	**B**	**C**	**D**	**E**
Cassava Wastes	45.00	45.00	45.00	45.00	45.00
Corn Bran	19.00	19.00	19.00	19.00	19.00
Cowpea Husk	12.00	12.00	12.00	12.00	12.00
Wheat Offals	12.00	12.00	12.00	12.00	12.00
Soya Beans Meal	10.00	0.00	0.00	0.00	0.00
L. acidophilus DLB07 treated JKC	0.00	10.00	0.00	0.00	0.00
L. plantarum DLB13 treated JKC	0.00	0.00	10.00	0.00	0.00
L. rhamnosus DLB23 treated JKC	0.00	0.00	0.00	10.00	0.00
Co-culture of Lactobacillus treated JKC	0.00	0.000	0.00	0.00	10.00
Salt	1.00	1.00	1.00	1.00	1.00
Vitamin-mineral premix	1.00	1.00	1.00	1.00	1.00
Proximate Chemical composition %					
Dry Matter	90.44	89.58	89.50	89.64	89.59
Crude Protein	14.30	13.48	13.89	13.48	14.84
Crude Fibre	20.49	20.58	23.29	22.68	19.20
Ash	9.49	8.05	7.69	7.17	7.31
Ether Extract	6.15	5.75	6.47	5.11	5.69
Nitrogen Free Extract	40.33	41.97	38.31	41.19	42.50
Total Digestible Nutrient	64.02	65.47	65.31	63.98	66.48

Experimental Animals and Management

Fifty growing WAD bucks of average weight of 6.10 ± 0.5 kg were used for this study. The animals were assigned to 5 dietary treatments of 10 goats in each experimental group in a completely randomised design (CRD). The animals were allowed to acclimatise for two weeks, during which they were prophylactically treated with antibiotics (Terramycin® L.A.) given intramuscularly at a dose rate of 20 mg/kg body weight and Ivermectin (Bimectin®) at 200 µg/kg body weight given subcutaneously against internal and external parasites.

Blood Collection

Ten (10ml) of blood was drawn from the jugular vein of twenty-five WAD bucks, using a 10 ml collapsible disposable syringe. The blood obtained was divided into two parts (5ml each), a part in universal plain bottles and the other part in heparinised (EDTA) bottles for biochemical and haematological analysis, respectively and was evaluated on the same day of collection at the Department of Chemical Pathology Laboratory, Faculty of Veterinary Medicine, University of Ilorin, Nigeria.

The blood samples were collected early in the morning, a swab of methylated spirit was used to clean the surface of blood collection, and blood samples were drawn from twenty (25) randomly selected bucks, five (5) from each treatment.

Haematology and Serum Evaluation

A complete blood analysis was done using a multi-parameter Automated Haematology Analyser (AH 5000 Hematology Analyzer) and blood chemistry were analyzed using the Cobas Integra 400 Plus (Roche), at Department of Chemical Pathology Laboratory, Faculty of Veterinary Medicine, University of Ilorin, Nigeria.

Statistical analysis

All Data obtained were subjected to a one-way analysis of variance (ANOVA) using Statistical Analysis System (SAS ®) software (2019). The means were separated using the Duncan multiple range test at $p \leq 0.05$.

Ethical approval

The ethics for this research was approved by the University of Ilorin Ethics Research Ethical Review Committee of the University of Ilorin, with the UERC Approval Number UERC/ASN/2023/2637.

RESULTS AND DISCUSSION

The haematological parameters of WAD goats fed lactic acid bacteria-based diet

The results obtained for the haematological parameters in this study are presented in Table 2. The mean values of Packed Cell Volume (PCV), Haemoglobin (Hb), Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin (MCH), Mean Corpuscular Haemoglobin Concentration (MCHC), Monocytes, Lymphocytes, Eosinophils and Basophil of WAD goats fed fermented-JKC (B, C, D and E) based diets were comparable to the control (A). However, erythrocytes (RBC), leucocytes (WBC) and Neutrophils were significantly different ($p < 0.05$) among all treatments. The best erythrocyte counts were obtained in the control group (A), while D recorded the highest WBC and Neutrophils.

The changes observed in the mean RBC, WBC and Neutrophils values of the experimental animals were consistent with the previous reports of Belewu *et al.* (2011) in WAD goat, Katole *et al.* (2011) in sheep and Katole *et al.* (2013) in goat fed diet containing biologically treated Jatropha seed cake. However, the values obtained in the current study are within the normal range for healthy goats for RBC, WBC and Neutrophils (Jiwuba *et al.*, 2021; Olawoye *et al.*, 2022) and the documented reference value for RBC, WBC and Neutrophils by Fielder (2022). All the values obtained in this study fell within the normal range recorded for healthy goats (Fraser & Mays, 1986; MSD, 2022; Olawoye *et al.*, 2022). PVC is relative to the quantity of RBC. The PCV is a measurement used to detect anaemia or polycythemia and to predict the change of hemodilution (Patras *et al.*, 2019).

The PCV (21.93 – 24.20 %) obtained in all groups in the present study was similar to the range reported by Daramola *et al.* (2005); Opara *et al.* (2010); Jiwuba *et al.* (2021) and Olawoye *et al.* (2022) for WAD goats and those of other breeds of goats (Tambuwal *et al.*, 2002; Waziri *et al.*, 2010) and fell within the normal reference value recorded for healthy goats (Fraser and Mays, 1986; MSD, 2022). However, the values obtained were lower than the value obtained for WAD goat fed Fungi treated Jatropha curcas kernel cake (Belewu *et al.*, 2011).

Table 2: Haematological parameters of WAD goats fed lactic acid bacteria-based diet

Parameters	A	B	C	D	E	± SEM	p-Value	Ref. Values
Packed Cell Volume %	24.20	23.00	21.00	23.20	23.67	11.6815	0.6580	22.00 – 38.00
Haemoglobin (g/dL)	8.78	8.62	8.97	8.80	8.31	0.7842	0.5605	8.00 – 12.00
Red BC ($\times 10^{12}$/L)	9.46[a]	7.91b[c]	7.73b[c]	6.08[c]	8.78[b]	0.3870	0.0001	7.00 – 18.00
MCV (fL)	60.34	59.10	58.88	59.72	63.13	9.8208	0.4154	16.00 – 25.00
MCH (Pg)	20.10	19.88	19.60	20.10	19.60	0.3700	0.6209	5.20 – 8.00
MCHC (g/dL)	33.38	33.76	31.28	33.76	29.80	5.2560	0.1095	30.00 – 36.00
WBC ($\times 10^{9}$/L)	10.05[b]	12.50[a]	10.50[b]	12. 96[a]	11.97[ab]	1.6865	0.0093	4.00 – 13.00

NEU (%)	32.80[ab]	31.20[ab]	29.40[b]	36.20[a]	31.33[ab]	16.348	0.0093	30.00 – 48.00
LYMPH (%)	65.60	65.00	66.40	60.60	65.33	15.7920	0.2082	50.00 – 70.00
MONO (%)	2.60	2.40	2.80	1.80	1.67	0.8140	0.2082	0.00 – 4.00
EOSIN (%)	1.00	1.400	1.400	1.400	1.00	1.5330	0.3111	1.00 – 8.00
BASO (%)	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.00 – 2.00

a, b, c, superscript on the means across the show significant difference ($p < 0.05$) along the row; control (A), (B 10 % L. acidophilus DLB07 treated JKC), (C 10 % L. plantarum DLB13 treated JKC), (D 10 % L. rhamnosus DLB23 treated JKC) and (E 10 % Co-culture of Lactobacillus treated JKC; PCV (%) – Packed Cell Volume; Hb (g/dL) – Hemoglobin; RBC ($\times10^{12}$/L) – Red Blood Cell; MCV (fL) – Mean Corpuscular Volume; MCH (Pg) – Mean Corpuscular Hemoglobin; MCHC (g/dL) – Mean Corpuscular Hemoglobin Concentration; WBC ($\times10^9$/L) – White Blood Cell; NEU (%) – Neutrophils; LYMPH (%) – Lymphocytes; MONO (%) – Monocytes; EOSIN (%) – Eosinophils; BASO (%) – Basophils

Reference values; Fielder (2022) in the MSD Veterinary Manuals; Katole et al. (2013); Belewu et al. (2011)

The serum biochemical profiles of WAD goats fed lactic acid bacteria-based diet

The serum biochemical profiles of WAD goats fed fermented-JKC-based diet are presented in Table 3. The results of the liver enzymes assay for ALP and AST differed significantly, while the ALP levels were similar among all treatments. Similarly, the metabolic indicator parameters creatinine, globulins, glucose, serum total protein and urea levels were different ($P < 0.05$) among all groups, while the serum albumin levels in the treatments were comparable in WAD goats fed A, B, C, D and E. Also, the results of the serum electrolytes analysis showed that the serum sodium, potassium, calcium, phosphate, bicarbonate and chloride were not comparable among all treatments.

The serum enzymes are indicators of liver health, and the best liver health result based on AST and ALP levels. The ALP, ALT, and AST values were within the range of those reported in Nigerian WAD goats by Olawoye *et al.* (2022). This is an indication that the test diets were properly detoxified and did not pose any negative effect on the animal, and the liver enzymes (ALP, AST and ALT) were not clinically affected. Increasing activities of the liver enzymes beyond the normal level are an indication of cell structure damage (Contreras-Zentella *et al.*, 2015). The finding of the result was in line with the reports of Kasuya *et al.* (2013) and El-Nomeary *et al.* (2021), who reported increased AST and decreased ALT values in lambs fed diets containing treated Jatropha seed meal compared to the lambs on the control diet. As found in this study, Anglo-Nubian goats fed Jatropha meal showed elevated AST enzyme activities within the normal range for healthy goats (Kaneko *et al.*, 1997). Da-Silva *et al.* (2015) stated that ALT and AST activities were not affected by the inclusion of ethanol-treated Jatropha Kernel cake.

For the assessment of feed safety in livestock, the blood enzymes ALT, AST, and ALP are valuable instruments with established values for the investigation of feed safety (Cônsolo *et al.*, 2018; Ayo-Ajasa *et al.*, 2022). Values above or below the normal range for these liver enzymes could be associated with different infections or diseases, toxins, or poisonous material in the feed (Chapman & Hostutler, 2015; Ayo-Ajase *et al.*, 2022).

The levels of creatinine in the current study varied significantly among treatments, but the values obtained fell within the normal range for healthy goats by Fielder (2022), except for goats on D, where an increase was observed. The increased serum creatinine levels may suggest reduced kidney performance, which could occur due to other factors like muscle mass or dehydration (Rashmi *et al.*, 2022).

Table 3: Serum biochemical profile of WAD goats fed lactic acid bacteria-based diet

Parameter	T1	T2	T3	T4	T5	± SEM	p-Value	Ref. Values
Serum Enzymes								
AST (IU/L)	22.80[c]	31.06[b]	28.12[b]	39.98[a]	20.32[c]	11.7520	< 0.0001	20.00-52.00
ALT (IU/L)	17.56	16.74	16.66	17.08	18.06	2.6528	0.6518	6.00 – 19.00
ALP (IU/L)	42.30[a]	37.44[ab]	29.86[b]	33.62[ab]	34.86[ab]	10.6772	0.0155	< 32
Metabolic Indicators								
Globulins (g/dL)	2.95[b]	3.06[b]	2.94[b]	2.79[c]	3. 31[a]	0.0093	< 0.0001	2.70 – 4.10
Glucose (mg/dL)	41.16[a]	26.03[bc]	29.26[b]	29.11[b]	43.15[a]	6.7783	< 0.0001	50.00 – 75.00
Creatinine (mg/dL)	111.30[b]	102.66[c]	115.98[b]	124.60[a]	84.40[d]	19.6730	0.0006	50.00 – 120.00
Urea (mg/dL)	5.86[b]	6.22[ab]	6.14[ab]	5.17[c]	6.64[a]	0.2082	< 0.0001	1.26 – 25.80
Protein (mg/dL)	6.88[b]	6.86[b]	6.42[c]	6.34[c]	7.56[a]	0.0556	< 0.0001	64.00 – 78.00
Albumin (mg/dL)	3.92[b]	3.80[ab]	3.66[cd]	3.55[d]	4.24[a]	0.0283	< 0.0001	27.50 – 39.70

Serum Electrolytes								
Na^+ (mmol/L)	127.73[b]	146.62[a]	141.32[a]	132.94[b]	145.12[a]	17.5377	0.0017	133.50–154.00
K^+ (mEq/L)	3.52[b]	4.05[a]	3.70[ab]	3.61[b]	3.99[ab]	0.0694	0.0104	3.50 – 6.70
Ca^{2+} (mmol/L)	2.36[b]	2.44[b]	2.39[b]	2.36[b]	2.78[a]	0.0667	0.075	1.15 – 10.60
PO_{3-} (mmol/L)	1.78[b]	1.80[b]	2.28[a]	1.88[ab]	1.92[ab]	0.1108	0.0748	1.40 – 2.90
HCO_2 (mmol/L)	21.24[b]	20.83[b]	20.96[b]	21.40[b]	22.92[a]	0.2908	0.1568	N/A
Cl^- (mmol/L)	107.10[a]	103.08[c]	104.32[bc]	101.74[c]	105.74[ab]	3.5950	< 0.0001	99.00 – 110.00

[a, b, c] superscript on the means across the show significant difference ($p < 0.05$) along the row; control (A), (B 10 % L. acidophilus DLB07 treated JKC), (C 10 % L. plantarum DLB13 treated JKC), (D 10 % L. rhamnosus DLB23 treated JKC), and (E 10 % Co-culture of Lactobacillus treated JKC; AST (Aspartate Aminotransferase), ALT (Alanine Aminotransferase), ALP (Alkaline Phosphatase), Na (Sodium), K^+ (Potassium), Ca^{2+} (Calcium), $PO_4{}^{3-}$ (Phosphate), $HCO_3{}^-$ (Bicarbonate), Cl^- (Chloride).

Reference Value; Fielder (2022) in the MSD Veterinary Manuals; Olawoye et al., 2022;

Carcass characteristics of buck fed lactic acid bacteria-based diet

The effects of fermented-JKC on carcass yield of growing WAD goat is presented in Table 4. The carcass parameters were comparable among all dietary treatments for major cuts and internal organs.

In this study, the WAD goats fed either of the experimental diets did not reveal any changes in the live weight, dressing percentage of carcass and non-carcass percentage. This was consistent with observations of other researchers (Eyoh & Ayuk, 2019; Coyne *et al*., 2019; Ma *et al*., 2023) The dressing percentage observed in this study agreed with the findings of Eyoh and Ayuk, (2019), who reported a range between 42.53 and 50.56 % for dressing percentage of WAD goat and Nagalakshmi and Dhanalakshmi, (2015) who reported average of 48.35% for lambs fed castor seed cake based diets, but higher than 38.3% - 44.20% obtained in lamb fed non-toxic Jatropha curcas seed (Oliveira *et al*., 2013).

Determination of dressing percentage and percentage of internal organs are viable tool in the determination of possible anti-nutritional substances present in the feeds and the level present in the feeds. It is also useful for the assessment of the toxicity of the feed fed to the animals (Alagbe *et al*., 2017).

The head, skin, blood, feet, tail, digestive tracts, reproductive tracts, respiratory tract and fat tissue are the components of the non-carcass (Shija *et al*., 2013; Jatnika *et al*., 2023). Nagalakshmi and Dhanalakshmi (2015) and Oliver *et al*. (2015) reported no significant difference in the non-carcass components of the lambs fed castor seed-based diets. Carcass and non-carcass weight gain depend on the diet's quality and quantity (Adhianto *et al*., 2020; Ma *et al*., 2023; Tahuk *et al*, 2023). In animal-fed feed of the same quality, the carcass weight and non-carcass components and non-edible (edible) components are not different, probably due to the same nutritional quality of the feed given, especially the protein content and energy of the ration (Ma *et al*., 2023).

Table 4: Carcass characteristics of Buck fed Lactic acid bacteria-based diet

Parameters	A	B	C	D	E	± SEM	p-value
Live-weight (kg)	10.60	9.95	9.55	9.30	10.48	0.3875	0.4147
Dressing %	50.44	47.37	46.92	46.53	50.56	2.5689	0.4436
Major Cuts (%)							
Neck	3.24	3.06	3.46	3.62	3.69	0.0253	0.9581
Forelimb	9.30	9.31	9.52	9.62	9.72	0.0155	0.0819
Hindlimb	10.28	10. 12	9.45	9.82	10.19	0.0208	0.0656
Rib cage	8.12	8.31	8.22	8.24	8.55	0.0168	0.0691
Loin	9.70	9.17	9.10	9.03	9.42	0.0311	0.1503
Feet	2.13	2.02	2.25	2.33	2.27	0.0157	0.2589
Internal Organs (%)							
Spleen	0.17	0.15	0.17	0.16	0.16	0.0001	0.8438
Liver	0.81	0.76	0.70	0.83	0.80	0.0311	0.3758
Lungs	0.95	0.98	1.00	1.02	1.05	0.0012	0.2920
Heart	0.46	0.48	0.48	0.49	0.55	0.0005	0.1694
Kidney	0.50	0.48	0.47	0.48	0.49	0.0004	0.1771
Pancreas	0.25	0.23	0.22	0.26	0.23	0.0002	0.1390

Testis	0.23	0.23	0.22	0.22	0.24	0.0002	0.6480
Full Stomach	10.48	10.45	10.96	10.01	10.58	0.1999	0.7105
Empty Stomach	4.26	4.37	4.49	4.06	3.82	0.2327	0.7830

[a, b, c] with different superscripts are significantly different ($p < 0.05$) along the row; control (A), (B 10 % L. acidophilus DLB07 treated JKC), (C 10 % L. plantarum DLB13 treated JKC), (D 10 % L. rhamnosus DLB23 treated JKC) and (E 10 % Co-culture of Lactobacillus treated JKC

CONCLUSION

From the results obtained, it can be concluded that substitution of SBM with strains of lactic acid bacteria-fermented Jatropha kernel cake at 10% inclusion in the diet of WAD goats revealed the potential of fermented JKC as an adequate replacement for SBM, and revealed no deleterious effect on the haematological and serum biochemical parameters of WAD bucks. Indicating good health status of the experimental goats.

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