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Serum and haematological parameters of growing rabbits fed sorghum brewers dried grain as replacement for maize

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Abstract

The study evaluated the serum and haematological parameters of growing rabbits fed sorghum brewer's dried grain (SBDG). Forty mixed breeds of rabbits (4-6weeks of age) were allotted into four experimental treatments in a completely randomized design. Four experimental diets were compounded by replacement of maize for the inclusion of SBDG at 0, 20, 30 and 40% of the diets. Rabbits fed diets containing SBDG (20%, 30% and 40%) had similar (p>0.05) level of serum glucose, total protein, globulin, albumin, AST, and ALP. Rabbits fed diet contained 20%SBDG had significantly the highest (P<0.05) ALT followed by 0%SBDG, 30% SDBG and 40%SBDG. Haemoglobin was significantly the highest (P<0.05) in rabbits fed diet contained 30%SBDG (15.80) followed by 0%SBDG (13.55), 20%SBDG (11.85) and least 40% (11.48). The RBC was significantly higher (P<0.05) for rabbits fed diets 30%SBDG and 20%SBDG than 0%SBDG and 40%SBDG diets whereas, the WBC was significantly similar (P>0.05) for rabbits fed diet 40% (6.75) and 0%SBDG (6.65) but significantly higher than 30%SBDG (5.90) and 20%SBDG (4.80). It could be concluded that the total replacement of maize for SBDG in the diet of rabbits had no adverse effects on the serum and haematological parameters.

Key words: agro-industrial waste, haematological, rabbits, serum

Introduction

The cost feeding accounts for over 50% of intensively reared rabbit in the tropics (Ogunsipe *et al*., 2011). This can be attributed to high cost of conventional feed sources in formulated concentrate diets (Olomu, 2011). Their seasonality as well as competing demand by man as food and industrial raw material has not helped in this regard. Several studies have revealed that the development and utilization of unconventional feedstuffs can greatly reduce the overdependence on conventional feed sources and subsequently reducing the cost of production of livestock. A characteristic of such alternative feedstuff should be its non-competitive usage with man, brewery by- products fall into this category (Dowling *et al*., 2003). Therefore of sorghum brewers waste (SBW) is derived from sorghum used solely. It is relatively cheap as large quantity is produced in local gin production (Awika *et al.,* 2001). It does not require much of additional processing such as grinding before being incorporated into livestock diets. The examination of blood provides the opportunity to clinically investigate the

presence of several metabolites and other constituents in the body and it plays a vital role in the physiological, nutritional and pathological status of the animal (Aderemi, 2004). Hence, this study evaluates the serum and haematological parameters of rabbits fed sorghum brewers dried grain at 0, 20, 30 and 40% inclusion levels.

Materials and Methods

Experimental location

The experiment was carried out at the Rabbit Unit of The Oke Ogun Polytechnic Teaching and Research Farm Saki, Oyo State. Nigeria. There experiment lasted for 8 weeks.

Management of rabbits

Forty growing rabbits of mixed sexes aged 4 - 6 weeks of age were used for the experiment. The rabbits were housed individually in iron net cages netted with wire mesh measuring 23 x 18 x 15 inch in dimension. There was a two-week adaptation period during which the rabbits were treated against parasitic infestation with ivermectin subcutaneous and multivitamin added to their water.

Experimental design

The experiment was laid out in a complete randomized design. A total of 40 rabbits were randomly allotted to four treatments at 10 rabbits per treatments in a one way analysis of variance model.

Processing of experimental diets

Fresh and wet local sorghum brewers waste was sourced from reputable local brewery in Saki metropolis, sun-dried on a concrete floor for three days and store in polythene bags for subsequent use. The experimental diets were pelleted and formulated to meet the recommended nutrient requirements of growing rabbits according to Lebas (2004) (Table 1).

Table 1: Feed ingredient and chemical composition of the experimental diets (%DM basis)

Ingredients	0%SBDG	20%SBDG	30%SBDG	40%SBDG
Maize	40.00	20.00	10.00	-
SBDG	-	20.00	30.00	40.00
Wheat offal	21.50	21.50	21.50	21.50
Groundnut cake	25.00	25.00	25.00	25.00
Palm kernel cake	10.00	10.00	10.00	10.00
Bone meal	2.00	2.00	2.00	2.00
Lysine	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Salt	0.50	0.50	0.50	0.50
Vitamin premix	0.50	0.50	0.50	0.50
Chemical composition of the diets (%)				
Dry matter	87.27	89.05	89.43	88.57
Crude protein	18.70	19.95	20.25	18.05
Crude fibre	9.38	11.10	13.66	14.61
Ether extractive	8.95	10.30	10.75	9.11
Ash	7.41	10.08	10.36	10.83
Nitrogen free extract	42.83	37.62	34.41	35.97

Blood analysis

At the end of the feeding period, the animals were starved of feed for 24 hours before blood samples were collected for serum and haematological analysis. The blood samples were collected from each rabbit from the external ear vein using a sterilized disposable syringe and needle between 6.30 and 7.30 am. An initial 1.0 ml blood was collected into labelled sterile sample bottles without anticoagulant and used to determine the serum components. Another 1.0 ml of blood was collected into labelled sterile universal bottles containing Ethylene-Diamine-Tetra-Acetic acid (EDTA) as anticoagulant. This was used to determine the haematological components within an hour of sample collection. The blood samples were centrifuged at 500 rpm (revolution per minute) for 3 minutes in a microcentrifuge to obtain serum that was free from cell debris for the biochemical analysis using a spectrophotometer (Available Commercial Kits produced by Sentinel, Italy) at a wavelength of 500 nm. The serum concentration of cholesterol, aspartate aminotransferase (AST), alkaline phosphate (ALP) and albumin were determined using commercial laboratory kit (Randox Laboratories Ltd, U.K). The red blood cell (RBC) counts, total white blood cell (WBC) counts, haemoglobin (Hb) concentration and packed cell volume (PCV) parameters were determined following standard procedures described by Davice and Lewis (1991).

Data analysis

Data collected were subjected to one-way analysis of variance procedure of the general linear model (SAS, 2008). The means were separated using the Duncan Multiple Range Test (Duncan 1955).

Results

Table 2: Serum parameters of rabbits fed diets contained SBDG

Parameter	0%SBDG	20%SBDG	30%SBDG	40%SBDG	SEM	P value
Glucose (g/dl)	111.40	129.35	101.40	78.95	9.79	0.4667
Total Protein (g/dl)	5.23	5.19	6.59	6.60	0.32	0.6784
Globulin (g/dl)	1.86	1.58	1.40	1.76	0.12	0.5081
Albumin (g/dl)	4.38	4.60	5.20	5.75	0.39	0.8276
Creatinine (g/dl)	1.62^{b}	4.25^{a}	4.00^{a}	2.00^{b}	0.56	0.2697
SOD (u/ml)	62.29^{a}	46.64^{b}	42.91^{b}	41.96^{b}	5.39	0.0153
AST (m/l)	18.89	22.76	16.81	18.18	0.94	0.8631
ALT (m/l)	69.58^{ab}	85.63^{a}	63.13^{b}	58.99^{b}	4.35	0.4414
ALP (m/l)	55.66	50.44	64.40	38.92	4.76	0.5414
Bilirubin Total (mg/dl)	4.77^{b}	9.31^{a}	4.28^{b}	9.87^{a}	1.04	0.0398

Table 2 shows the serum metabolite of rabbit fed the experimental diets. The diet containing SBDG (20%, 30%and 40%) had significantly similar ($p>0.05$) values of glucose, total protein, globulin, albumin, AST and ALP. There is significant difference ($p<0.05$) in the creatinine percentage where diets 20%SDBG and 30%SDBG had the significantly highest ($p<0.05$) values than 0%SBDG and 40%SDBG. The SOD percentage was significantly highest ($p<0.05$) in animals fed 0%SBDG compared to 20%SBDG, 30%SBDG and 40% SBDG. Rabbits fed diet contained 20%SBDG had significantly highest ($P<0.05$) ALT followed by 0%SBDG, 30% SDBG and 40%SBDG. Diet 20%SBDG had the significant highest percentage of bilirubin total compared to rabbits fed 0% SBDG, 30% SDBG and 40%SDBG diets.

Table 3: Haematological parameters of rabbits fed SBDG

Parameter	0%SBDG	20%SBDG	30%SBDG	40%SBDG	SEM	P value
Packed cell volume (%)	35.55^{ab}	34.59^{b}	36.65^{a}	34.75^{b}	0.61	0.0313
Haemoglobin (g/dl)	13.55^{b}	11.85^{c}	15.80^{a}	11.48^{c}	0.66	0.1181
Red blood cell ($x10^{12}$)	4.83	6.14	6.49	4.20	0.85	0.8804
White blood cell ($x10^{9}$)	6.65	4.80	5.90	6.75	0.49	0.6456
Lymphocyte (%)	55.90	53.80	56.20	51.90	1.47	0.6842
Middle cell (%)	4.15^{ab}	1.35^{b}	1.90^{b}	7.85^{a}	1.04	0.0838
Granulocyte (%)	0.38^{b}	0.35^{b}	0.30^{b}	3.95^{a}	0.58	0.0164
Haematocrit (HCT)	34.45^{c}	47.40^{a}	35.55^{c}	40.55^{b}	1.97	0.0095
MCV	50.65	50.90	54.75	53.10	1.25	0.7877
MCH	4.12	4.25	4.23	4.34	0.06	0.8308
MCHC	65.35^{a}	32.53^{b}	15.00^{c}	29.00^{b}	10.82	0.3589

There were significant differences among the means of haematological parameter of rabbit fed SBDG (Table 3). The haemoglobin was significantly highest ($P<0.05$) in rabbits fed diet 30%SBDG followed by 0%SBDG, 20%SBDG and least 40%SBDG. The RBC was significant similarly ($P>0.05$) for rabbits fed diet 30%SBDG and 20%SBDG but significantly higher than 0%SBDG and 40%SBDG whereas, the WBC was significantly similar ($P>0.05$) for rabbits fed diet 40%SBDG and 0%SBDG compared to 30%SBDG and 20%SBDG. Rabbit fed diet 0%SBDG, 20%SBDG and 30%SBDG had significantly higher ($P<0.05$) lymphocyte compared to diet 40%SBDG. Furthermore, there were no significant ($P>0.05$) differences among all the means of granulocyte except for 40%SBDG. The Platelete content for rabbits on diets 0%SBDG and 40%SBDG were significantly higher ($P<0.05$) than 30%SBDG and 20%SBDG diets.

Discussion

Blood is an important index of physiological, pathological and nutritional status in the organism (Olorode *et al*., 2007). The glucose values in this study were relatively similar to 111.13 – 124.93 reported by Terzungwe *et al.* (2013) for rabbits fed *Moringa oleifera* leaves. The total protein content reported in this study were slightly higher than the range (4.81- 5.48g/dl) reported by Odetola *et al.* (2012). The globulin concentrations were lower than the values (2.55 – 2.77) reported by Olabanji *et al.* (2007). The albumin was similar to value recorded by Ayandiran *et al.* (2019) for rabbits fed bread waste and Moringa based diet. Mean values of ALT for rabbit fed SBDG were close to the normal range of (48.5-78.9) reported by Mitruka and Rawnsley (1997). The serum enzyme activities above the normal range are abnormal and are an indication that the animal might have suffered liver and/or kidney damage. Hence, most serum metabolite values of rabbits in this study fell within the normal physiological range as reported by literatures. The PCV in this study were lower than 43.30-46.77 (Federick, 2010) but higher than 32.25-34.78 reported by Ayandiran (2019). The RBC values (4.20-6.49) obtained in this study were close to the normal ranges of 5.0-8.0 as reported by (Ahamefule *et al*., 2008). The white Blood Cells Count of 5 – 13 is considered to be within normal

range according to Burke (1994). Furthermore, the MCV values were close to the reference values of (60.00-69.00) reported for apparently healthy rabbits (Madirabbit, 2011); but higher than 32.75-34.00 reported by Bitto *et al*. (2006). The MCH values reported in this study was relatively low compared to the values reported (19.85-20.06) by Togun *et al*. (2007) while the Njidda *et al*. (2006) posited that MCV, MCH and MCHC are used in diagnosing anaemic conditions. The lymphocyte values obtained were however above the stipulated values obtained were however above 41.0-53.5 reported by Aderemi *et al.* (2014) for rabbits fed Soybean with *Tephrosia linearis* meals. The increased PCV and haemoglobin contents of rabbits fed diet contained 30%SBDG could be attributed to higher dietary protein content compared to other diets in this study. However, haematological parameters in this study indicated that SBDG fed to rabbits compared favourably with other feed ingredients fed to rabbits as reported by literatures. Thus, SBDG could be fed to rabbits with no deleterious effects.

Conclusion

It could be concluded that the total replacement of maize for SBDG in the diet of rabbits had no adverse effect on the serum and haematological parameters.

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