

## **Performance indices and blood parameters of growing rabbits fed molasses improved sorghum brewers dried grain**

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**Target Audience:** *Animal scientists, rabbit farmers, breweries*

### **Abstract**

*The study evaluated the performance indices and blood parameters of growing rabbits fed molasses improved sorghum brewer's dried grain (MISBDG). Forty mixed breeds of rabbits (4-6weeks) were allotted into four treatments in a completely randomized design. Four mash diets (T1, T2, T3 and T4) were compounded by replacement of maize with inclusion of MISBDG at 0, 20, 30 and 40% of the diets. There were no significant differences ( $p>0.05$ ) among the means of daily feed intake, final weight gain daily weight gain and feed conversion ratio of rabbits. There were significant differences ( $p<0.05$ ) among the means of the haematological indices of the experimental diets except for the means of lymphocytes and monocytes which were significantly similar ( $p>0.05$ ). The packed cell volume, red blood cell and neutrophil contents of rabbits fed MISBDG diets were significantly higher compared to control fed rabbits.. The counts of white blood cell were significantly highest ( $p<0.05$ ) in rabbits fed diets T3 (7.10), T4 (6.10), T1 (6.25) than T2 (5.75). Animals fed diets containing MISBDG were significantly higher ( $p<0.05$ ) in blood cholesterol, globulin, alanine aminotransferase and glucose contents. Also animals fed diet T3 had significantly highest ( $p<0.05$ ) total protein and albumin contents followed by diet T4, T1 and T2. It could be concluded that inclusion of graded levels of MISBDG in the diets of growing rabbits led to comparable performance indices and had no negative effects on the blood parameters instead enhanced the health status of the experimental rabbits.*

**Keywords:** *Haematology, serum, rabbits, sorghum, brewers grains*

### **Description of Problem**

The recent understanding of the usefulness of the meat for diabetics, hypertensive and middle aged people has further raised awareness on the production of rabbits, thus increasing the demand for rabbit meat (1). Animal protein contain essential amino-acids, which helps in the body tissue synthesis, replenishing the nitrogen lost in urine, faeces, saliva, desquamated skin, hair and nails. Protein also supplies a level of energy and growth, increase body immunities (2) . The cost of conventional

feed ingredient such as maize has been on the increase from year to year leading to increase in the price of animal protein sources (3). The competition between man and livestock for these feed ingredients coupled with their high cost call for search for alternative non-conventional feed ingredient that would be used in place of conventional feed ingredients. The utilization of agro-industrial by-products in animal feed has increased so as to reduce the cost of feed ingredients. Agro-industrial by-products are waste products arising from the

processing of crops or animals products usually by an agro-industrial firm. The production of sorghum brewers waste (SBW) is derived from sorghum used solely or in combination with other cereal grains like maize (maize-sorghum) in the production of burukutu (4). Sorghum brewers dried grain does not require much of additional processing such as grinding before being incorporated into livestock diets. It was reported (5) that sorghum brewers dried grain could replace maize up to 30% in the diets of growing rabbits. However, molasses being a ready source of soluble carbohydrate could improve and upgrade the nutrient content of sorghum brewer dried grains as well as have significant effect in the blood glucose content of animals. 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 (6). Hence, this study evaluated the effect of molasses improved sorghum brewers dried grains on the growth performance, haematological indices and serum metabolites of growing rabbits.

## **Materials and Methods**

### **Location of the study and period**

This study was conducted at the Department of Animal Health and Production Technology, The Oke Ogun Polytechnic, Saki Teaching and Research farm which lasted for 10 weeks (2 weeks adaptation period, 8 weeks of feeding trial).

### **Processing of experimental diets**

Fresh and wet local sorghum brewers wastes were sourced from reputable local brewery in Saki metropolis, sun-dried on a

concrete floor for three days and stored in polythene bags for subsequent use. Four experimental diets (T1, T2, T3 and T4) were formulated with inclusion of sorghum brewers dried grains at 0, 20, 30 and 40% levels respectively as well as addition of 10% molasses to all the experimental diets. The experimental diets were pelleted and formulated to meet the recommended nutrient requirements of growing rabbits according to (7)

### **Management of rabbit**

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. Feed were been supplied to the animal every morning throughout the experimental periods. Each of the animals was weighed before the commencement of the experimental and subsequently during the experimental period. The left-over feed was weighed to estimate the feed intake from the feed offered.

### **Experimental design and data analysis**

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 and each rabbit acted as a replicate. Data collected were subjected to one way analyses of variance procedure of the general linear model (8) the mean were separated using the Duncan multiple range test.

**Table 1: Gross composition of the experimental diets fed to growing rabbit**

Ingredients	T1	T2	T3	T4
Maize	40	20	10	-
SBDG	-	20	30	40
Molasses	-	10	10	10
Wheat-offal	21.5	11.5	11.5	11.5
GNC	25	25	25	25
PKC	10	10	10	10
Bonemeal	2.0	2.0	2.0	2.0
Lysine	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Salt	0.5	0.5	0.5	0.5
Vit premix	0.5	0.5	0.5	0.5
Total	100%	100%	100%	100%

<sup>1</sup>Premix provided per kg diet: vitamin A, 12,000 IU; vitamin D3, 1,000 IU; vitamin E acetate, 50 mg; vitamin K3, 2 mg; biotin, 0.1 mg; Fe, 100 mg; Cu, 20 mg; Mn, 50 mg; Co, 2 mg; I, 1 mg; Zn, 100 mg; Se, 0.1 mg; Robenidine, 66 mg.

GNC: Groundnut cake, PKC: Parm kernel cake

Growth data not explained or appropriately captured.

### Blood sample collection

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 (9).

### Results and Discussion

Performance characteristics of growing rabbits fed MISBDG.

There were no significant differences ( $p>0.05$ ) among the means of daily feed intake, final weight gain daily weight gain and feed conversion ratio of rabbits as shown in Table 2 . The feed intake was similar to 41.20g reported by (10). The average daily weight gain was higher than the values of 6.78 – 8.64g per day reported by (11) for rabbit reared in tropical countries. The FCR were lower than the value 3.6g – 6.00g reported by (12). However, the FCR

obtained in this study was higher than the results obtained by (13) for growing rabbit in Nigeria. Therefore, MISBDG could replace maize up to 40% in the diets of rabbits as indicated by comparable performance indices.

**Table 2: Performance characteristics of rabbit fed MISBDG in the diet of weaner rabbits**

Parameters	T1	T2	T3	T4	SEM
Feed intake(g/day)	39.67	42.84	42.87	40.73	2.20
Initial weight(g)	1014.60	1001.40	998.80	1003.60	65.51
Final weight(g)	1729.60	1639.40	1660.20	1714.20	67.74
Daily weight gain(g)	13.52	12.03	12.47	13.40	0.67
Feed conversion ratio (FCR)	3.02	4.19	3.74	3.08	0.36

a,b,c,d means within the same row with different superscripts are significantly different. (p<0.05).

There were significant differences (p<0.05) among the means of the haematological indices of the experimental diets except for lymphocytes and monocytes which were unaffected (p>0.05) as indicated in Table 3. The packed cell volume, red blood cell and neutrophil contents of rabbits fed MISBDG diets were significantly higher compared to rabbits on control diet. The counts of white blood cell were significantly highest (p<0.05) in rabbits fed diets T3 (7.10), T4 (6.10), T1 (6.25) than T2 (5.75). However, T1 (12.85) had significantly highest (p<0.05) eosinophil than other MISBDG diets. Blood is an important index of physiological, pathological and nutritional status in the organism (14). The packed cell volume in this study was higher than 34.59 – 36.65 reported by (5) for rabbits fed sorghum brewers dried grains but similar to the 43.30 – 46.77 (15). The red blood cell counts in this study was higher than that recorded by (16) for weaner rabbits fed bread waste and Moringa based diets. However, rabbits fed diets containing MISBDG had higher red

blood cell counts which affirmed the claim of (17) who reported that increased red blood cell count values are associated with high quality dietary protein and with disease free animals. Also the white blood cell count was higher than 4.34 – 5.88 observed by (18) in rabbits fed mixture of cassava peels and layer's manure. All the haematological parameters measured in the present experiment were within the normal physiological ranges reported for rabbits; haemoglobin (8.0 – 17.5g/dl), packed cell volume (30.0 – 50.0%), red blood cell (4.0 – 8.0×10<sup>6</sup> /μl), white blood cell (5.0 – 12.0 × 10<sup>3</sup> /dl), neutrophils (35.0 – 55.0%), lymphocytes (25.0 – 50.0%) and eosinophils (0.0 – 5.0%) (19). Haematological components of blood are also valuable in monitoring feed toxicity especially with feed constituents that affect the formation of blood (20). Therefore, inclusion of molasses improved sorghum brewers dried grains in the diets of growing rabbits had no negative effects but rather improved the haematological indices.

**Table 3: Haematological indices of growing rabbit fed molasses improved sorghum brewers dried grain**

Parameter	T1	T2	T3	T4	SEM
Packed Cell Volume (%)	38.50 <sup>b</sup>	42.00 <sup>a</sup>	43.00 <sup>a</sup>	45.50 <sup>a</sup>	2.62
Red Blood Cell ( $\times 10^{12}$ )	3.90 <sup>bc</sup>	4.40 <sup>b</sup>	4.25 <sup>b</sup>	5.25 <sup>a</sup>	0.29
White Blood Cell ( $\times 10^{10}$ )	6.25 <sup>b</sup>	5.75 <sup>c</sup>	7.10 <sup>a</sup>	6.10 <sup>b</sup>	0.47
Lymphocytes (%)	35.00	35.50	32.50	34.50	2.09
Neutrophils (%)	29.50 <sup>b</sup>	37.50 <sup>ab</sup>	42.00 <sup>a</sup>	38.00 <sup>ab</sup>	1.96
Monocytes	3.00	3.50	4.06	3.20	0.35
Eosinophils (%)	3.85 <sup>a</sup>	2.30 <sup>b</sup>	2.65 <sup>b</sup>	3.50 <sup>ab</sup>	0.57

a,b,c,d means within the same row with different superscripts are significantly different. ( $p < 0.05$ ).

There were significant differences ( $p < 0.05$ ) in the mean values of all the serum metabolites examined (Table 4) in this study. Animals fed diets containing MISBDG were significantly higher ( $p < 0.05$ ) in blood cholesterol, globulin, alanine aminotransferase and glucose contents. Also, animals fed diet T3 had significantly highest ( $p < 0.05$ ) total protein and albumin contents followed by those on diets T4, T1 and T2. However, the alkaline phosphate (m/l) content was highest in T2 (57.50), followed by T4 (43.50), T1 (39.50) and the least T3 (31.00). Blood chemistry constituents reflect the physiological responsiveness of the animal to its internal and external environments which include feed and feeding (21). The cholesterol content in this study was lower than 59 m/dl reported by (22). The total protein and globulin contents

here were higher than the values of (5) for rabbits fed sorghum brewers dried grains. This might be attributed to the effect of molasses in the diets. Also worthy of note was the glucose content of diets containing molasses which was highly superior to the other diet however fell within the normal range (75.6 - 147.6 g/dl) reported by (23). Although the values for total protein, albumin and globulin did not show any peculiar trend, the values obtained and that of cholesterol were found to be within the normal physiological range for rabbits; total protein (5.4 - 7.5 g/dl), albumin (2.5 - 4.5 g/dl), globulin (1.9 - 3.5 g/dl) and cholesterol (35.0 - 60.0 mg/dl) (24). Hence, molasses improved sorghum brewers dried grains in the diets of rabbits had no deleterious effects on the blood serum metabolites.

**Table 4: Serum metabolites of rabbits fed molasses improved sorghum brewers dried grain**

Parameters	T1	T2	T3	T4	SEM
Cholesterol (mg/dl)	33.00 <sup>c</sup>	40.50 <sup>b</sup>	46.50 <sup>a</sup>	38.00 <sup>b</sup>	4.51
Total Protein (g/dl)	6.75 <sup>ab</sup>	5.20 <sup>c</sup>	7.25 <sup>a</sup>	6.35 <sup>b</sup>	0.30
Albumin (g/dl)	3.35 <sup>ab</sup>	2.60 <sup>c</sup>	3.50 <sup>a</sup>	3.00 <sup>b</sup>	0.14
Globulin (g/dl)	1.50 <sup>c</sup>	3.00 <sup>a</sup>	3.40 <sup>a</sup>	2.50 <sup>b</sup>	2.51
Bilirubin (mg/dl)	0.55 <sup>a</sup>	0.15 <sup>c</sup>	0.20 <sup>bc</sup>	0.50 <sup>ab</sup>	0.07
Alkaline phosphate (m/l)	39.50 <sup>b</sup>	57.50 <sup>a</sup>	31.00 <sup>c</sup>	43.50 <sup>b</sup>	3.68
Alanine Amino-transferase (m/l)	14.50 <sup>b</sup>	18.00 <sup>a</sup>	19.00 <sup>a</sup>	18.50 <sup>a</sup>	0.88
Glucose (g/dl)	116.00 <sup>b</sup>	128.00 <sup>a</sup>	126.80 <sup>a</sup>	127.02 <sup>a</sup>	5.21

a,b,c,d means within the same row with different superscripts are significantly different. ( $p < 0.05$ ).

### Conclusion and Applications

1. It could be concluded that inclusion of graded levels of MISBDG in the diets of growing rabbits led to comparable performance indices and had no negative effects on the blood parameters instead enhanced the health status of the experimental rabbits.
2. Therefore, molasses could be included in high fibre diets to improved feed intake and nutritive value.

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