International Journal of Global Affairs , Research and Development (IJGARD) Vol.2, No.2, 2024, 46-61
ISSN 2992-2488

NUTRIENT DIGESTABILITY, HAEMATOLOGICAL AND SERUM BIOCHEMICAL PROFILES OF GROWER PIGS FEED SUNDRIED BREWER'S DRIED GRAIN SUPPLEMENTED WITH QUADRAXYME®

Bako, M. I.*, Olusiyi, J. A., Lamalang, E. B. and Omotoso O. B.

Department of Animal Production and Health, Faculty of Agriculture and Life Science, Federal University Wukari, Taraba State, Nigeria.

***Correspondence**: maryamibrahimbako@gmail.com; +2348156128795,

ABSTRACT

The study investigated the apparent nutrient digestibility, haematological and serum biochemical indices of pigs fed graded level of sundried brewer's dried grain supplemented with quadraxyme. Eighteen (18) local breeds of grower pigs with an average weight of 12.00kg were sourced within Wukari metropolis. The pigs were divided into three groups of six animals per group replicated three times in a completely randomized design. The animals were fed ad libitum and the experiment lasted for 56 days. Diet 1 served as control containing 100% maize bran, diets 2 contain 50% maize bran and 50% SDBG and diet 3 contain 100% SDBDG inclusion levels respectively. The diets were supplemented with 0.2kg /100kg of Quadraxyme. Data collected during the study were subjected to Analysis of Variance using JMP SAS (2014) version13. Significant level of difference among treatment means were separated using the same statistical tool. Result from the digestibility trial shows that all parameters are significant, haematological and biochemical analysis showed all parameters were not significantly(0.05) different. The treatment with supplementation of sundried brewer's dried grain with enzyme improved the crude fibre, dry matter, crude protein and ether extract digestibility of the pigs when compared to those fed maize diet. Sundried brewer's dried grain improved the WBC, MCH, RBC, Haemoglobin, Haematocrit, MCHC, urea, albumin, globulin and creatinine levels but did not affect the MCV, cholesterol and glucose levels of pigs. Compared to pigs fed maize diet, the sundried brewer's dried grain supplemented with enzymes improved the pigs' crude fibre, dry matter, crude protein, and ether extract digestibility. It also improved the pigs' WBC, MCH, RBC, Haemoglobin, Haematocrit, MCHC, urea, albumin, globulin, and creatinine level. It was concluded that T2(50%) sun dried brewers dried grains supplemented with enzyme had the best array of nutrient digestibility, haematological and serum biochemical values. This study recommends the use of 50% sun dried brewers grain supplemented with enzyme in pig diets because of superior nutrient digestibility, haematological, and serum biochemical parameters.

Keywords: Nutrient Digestibility, Brewer's Dried Grain, Supplement, Quadraxyme®, Growing Pigs

1.0 INTRODUCTION

Globally livestock farmers depend heavily on livestock rearing for their livelihood (FAO, 2011). The swine sub-sector, like other livestock sectors, significantly increases the supply of animal protein in many countries. In the meantime, the majority of developing nations, such as Nigeria, have reported

success in pig production in recent years thanks to the importation of nearly all technological components, such as parent and breeding stock, equipment, medications, and feed (Perez, 1997). Cereal grains and oil meals make up the majority of pig feeds, which theoretically compete with human food either directly or indirectly. To attain sustainable livestock development, the base of feed resources must be expanded to include non-traditional feedstuffs that do not compete with current feed sources, and present feed resources must be used efficiently (FAO, 2013).

In many societies, raising pigs has a variety of purposes, including generating cash, providing food, storing riches for use in difficult times, and acting as valuable props in some customary rituals (Kagira *et al*., 2010). Pigs are among the most common and rapidly expanding animals, and they are good at turning food scraps into useful animal products (Osaro, 1995). A common by-product of the brewing industry, brewer's grain meal (BGM) has a relatively high protein content (19–30% w/w) and is rich in several bioactive chemicals, including phenolic compounds, hydroxycinnamic acids, and growth factors that are yet to be found (Ikram *et al*., 2013).

BGM is frequently utilized as an affordable alternative to traditional protein in aquaculture feed and as a protein feed for cattle (Martin *et al*., 2020, Shen *et al*., 2019). BGM has advantages, however, because of its high dietary fibre content (30–50% w/w), its usage in swine feed is restricted (Becker *et al*., 2021). Lignocelluloses, which include cellulose, hemicellulose (40 percent arabinoxylan), and lignin (20–28% w/w), make up its major constituents (about 50% w/w) (Kagira *et al*., 2010). According to Amoah *et al*. (2017), giving weaned pigs a diet containing 20% BGM has a negative impact on their development and eating efficiency. The purpose of this study was to investigate the digestibility as well as the haematological and serum biochemical parameters of grower pigs fed diets substituted with sundried brewer's dried grain supplemented with enzyme.

2.0 MATERIALS AND METHODS

2.1 Study Area

The study was carried out at the Swine Unit ,Teaching and Research Farm of the Department of Animal Production and Health, Federal University Wukari, Taraba State. Wukari is located at longitude 9°47'0" E and latitude 7°51' 0" N longitude 9°47' 0"E. The vegetation of the area is predominantly characteristics of savannah zone and with major climatic seasons of wet or rainy seasons, which starts in March or April, and ends in October and the dry season which starts in November and ends in March or April (Olawale and Confidence, 2021).

2.2 Experimtal Animals and their Management

Eighteen (18) local breed of grower pigs with an average weight of 12.00kg were sourced within Wukari metropolis. The pigs were divided into three groups of six animals per group replicated three times in a completely randomized design. Each pen was provided with feeders, drinkers and wallow. Animals were dewormed before the commencement of the experiment. Hygiene and sanitation practices were performed daily. The animals were fed *ad libitum* and the experiment lasted for 56 days.

2.3 Experimental Diets

Three dietary treatments were compounded using sundried brewer's grain (SDBDG). Diet 1 was served as control containing 100% maize bran while Diets 2 contain 50% maize bran and 50% SDBG and Diet 3 contain 100% SDBDG inclusion levels respectively. The diets were supplemented with 0.2kg /100kg of Quadraxyme® (Table 1).

Table 1. Ingredient Composition of Experimental Diets

	Dietary treatments		
Ingredients	T1	T2	T3
Maize	48.00	48.00	48.00
Soyabean meal	25.00	25.00	25.00
Maize bran	25.00	12.50	0.00
SDBDG	0.00	12.50	25.00
Bone meal	1.00	1.00	1.00
Methionine	0.30	0.30	0.30
Lysine	0.20	0.20	0.20
*Premix	0.20	0.20	0.20
Salt	0.30	0.30	0.30
**Enzyme	0.00	0.20	0.20

**premix composition (per kg of diet): vitamin A, 12500 IU; vitamin D_3, 2500 IU; vitamin E, 50.00 mg; vitamin K_3, 2.50 mg; vitamin B_1, 3.00 mg; vitamin B2, 6.00 mg; vitamin B_6, 6.00 mg; niacin, 40 mg; calcium pantothenic, 10 mg; biotin, 0.08 mg; vitamin B^{12}, 0.25 mg; folic acid, 1.00 mg; chlorine chloride, 300 mg; manganese, 100 mg; iron, 50 mg; zinc, 45 mg; copper, 2.00 mg; iodine, 1.55 mg; cobalt, 0.25 mg; selenium, 0.10 mg; and antioxidant, 200 mg*

*** Enzyme composition per kg diet: amylase 110,000units, cellulose 500,000.00units, xylanase 1,000,000units, lipase 10,000units, pectinase 30,000.0units and 4,000 units.*

2.4 Digestibility Trials

At the end of the feeding trial, eighteen (18) experimental pigs (three per treatment) were used for the digestibility trial. The pigs were separately kept for five days to acclimatize before data collection began. The pigs were starved for 12 hours prior to the experimental feeding to clear the gut of the previous meals, especially as markers were not used. Faeces were collected on a daily basis, every morning (7.30 am-8.30 am). The faeces were sun-dried and weighed daily until there was constant weight. At the end of 7 days collection period, faeces from each replicate were mixed, ground and representative samples taken for proximate composition determination. Dry matter digestibility (DM) was calculated from the differences between DM intake and faecal DM output expressed as percentage of DM intake. Digestibility of other nutrients was calculated from the differences between the nutrient's intake and the nutrients output in the faeces. The percentage of the nutrient (DM, crude protein, crude fibre, ash and ether extracts) were estimated according McDonald *et al*. (2002) method: The nutrient digestibility was calculated using the formular below:

Digestibility(%) = (nutrient in feed –nutrient in feaces)/ nutrient in feed x 100

2.5 Haematological Analysis

On the last day of the feeding trial, blood samples were collected from 3 pigs per treatment for the determination of haematological and serum biochemical parameters.In order to dilate the ear vein, the ear was gently stroked and soaked alcohol swab was used to clean the ear. The vein was then occluded at the base of the lateral surface of the ear after which the needle was slid towards the base of the ear for blood collection. Blood Samples for haematological analysis was collected into properly labelled sterilized bottles containing 0.2g of EDTA (Ethylene diamine tetra-acetatic acid) as anticoagulant using 5ml sterile disposable syringes and needles (21 gauge) as described by Tegbe*et al.* (2016). The following parameters: (pack cell volume, red blood cells, haemoglobin, white blood cells and its differentials (lymphocytes, neutrophils, eosinophils, basophils and monocytes) was analysed according to Baker and Silverton, (1985).

2.6 Biochemical Analysis

Serological samples were collected into anticoagulant free tubes. Serum was obtained after the blood was allowed to stand for two 2 hours at room temperature and centrifuged at 2000 revolutions per minute (rpm) for 10 minutes to separate the cells from the serum. The serum biochemical parameters determine are total protein, albumin, globulin, glucose, nitrogen urea and cholesterol according to Biuret methods described by Boontiam et al. (2022).

2.7 Experimental Design and Statistical Analysis

All Data collected during the study were subjected to Analysis of Variance using JMP SAS (2014 version13). Significant level of difference among treatment means were separated using the same statistical tool.

2.8 Chemical Analysis

The proximate composition of the sun dried brewers dried grain and the experimental diets were determined according to the methods of AOAC (1990). The parameters taken were for; Moisture, Crude protein, Crude fiber, Ether extract, Nitrogen-free extract and Ash content.

3. 0 RESULTS AND DISCUSSION

3.1 Proximate Composition of the Test Ingredient and Experimental Diets

The proximate composition of the test ingredient and experimental diets is shown on Table 2. The crude protein of the experimental diets were; 18.50, 19.93and 21.58 respectively for diets 1 ,2 and 3.The crude protein obtained for the sun dried brewers dried grain was 26.32 which was almost at par with 25.04% obtained by Babarinde *et al (*2020)

The crude fibre content of the sun dried brewers dried grain (19.92), is higher than 11.16% reported by Mufwa *et al* (2011), and its closely related to 18.00% reported by Babarinda *et al* (2020).

The result of the ether extract, and ash for the sun dried brewers dried grains were; 9.97 and 6.97 respectively. The NFE obtained for the sun dried brewers dried grain was 33.83, this is low and would require supplementation with another energy source

Table 2: Proximate Composition of Experimental Diets and Sun Dried Brewers Dried Grain

Treatments	T1	T2	T3	SDBDG
Moisture	8.28	10.67	11.59	4.75
Crude Protein	18.50	19.93	21.58	26.32
Crude Fiber	5.71	4.39	4.08	19.92
Ash	7.82	7.59	6.97	9.21
Ether Extract	5.49	6.27	7.05	6.97
Nitrogen Free Extracts	54.2	51.15	48.73	33.83

3.2 Nutrient Digestibility of Grower Pigs fed Sundried Brewer's Dried Grain Supplemented with Enzyme

The nutrient digestibility of grower pigs fed sundried brewer's dried grain supplemented with enzyme is shown in Table 3. The result shows significant ($P<0.05$) effect of sundried brewer's dried grain supplemented with enzyme on the nutrient digestibility of pigs. The values of dry matter digestibility, crude protein digestibility, crude fibre digestibility and ether extract digestibility ranges from 54.67 to 82.00, 52.00 to 79.49, 46.33 to 76. 12 and 62.33 to 76.67 percent respectively. Replacement with sundried brewer's dried grain supplemented with enzyme at 100% in the diet of pigs had higher crude fibre digestibility. Highest dry matter digestibility, crude protein digestibility and ether extract digestibility was observed in diet replaced with 50% sundried brewer's dried grain. Dry matter digestibility was lowest in pigs fed the control diet (54.67). It increased with increasing level of sundried brewer's dried grain to 82.00% in diet with 50% sundried brewer's dried grain.

Further increase in feed supplemented 100% sundried brewer's dried grain decreased the dry matter digestibility to 76.97. The values for dry matter digestibility were not different ($P<0.05$) for pigs fed

50% and 100% sundried brewer's dried grain but differ significantly (P<0.05) when compared to those fed control diets. Lower values for dry matter digestibility (34.02 - 41.84) was reported in the work of Adebiyi *et al*. (2020) for grower pigs fed diets substituted with watermelon waste.

Crude protein digestibility was lowest in the control diet (52.00). It increased to 79.49 in diet supplemented with 50% sundried brewer's dried grain diet. Feed supplementation with 100% sundried brewer's dried grain gave lower crude protein digestibility (71.99) when compared to diet containing 50% sundried brewer's dried grain. The values differ significantly (P<0.05) among pigs fed all diets. Wafar *et al*. (2022) reported lower values for crude protein digestibility of weaner pigs fed cereal milling by –products in Diets (50.67 - 69.80). Crude fibre digestibility was lowest in the control diet (46.33). Feed replacement with 50% and 100% sundried brewer's dried grain increased the crude fibre digestibility to 75.95 and 76.12 respectively. Crude fibre digestibility was highest in the 100% sundried brewer's dried grain diet. The values for crude fibre digestibility were not different (P<0.05) for pigs fed 50% and

100% sundried brewer's dried grain but differ significantly (P<0.05) when compared to those fed control diets. The values reported in this study were higher than the crude fibre digestibility of 57.74 - 66.82% in growing rabbits fed urea -molasses treated maize cob as reported by Mafimidiwo *et al*. (2022). Ether extract digestibility was lowest in the control diet (62.33). The ether extract digestibility increased with increasing level of sundried brewer's dried grain to
76.67 in 50% sundried brewer's dried grain diet. Further increase in feed supplemented 100% sundried brewer's dried grain decreased the ether extract digestibility to 69.00. The values for ether extract digestibility were not different (P<0.05) for pigs fed control diet and 100% sundried brewer's dried grain but differ significantly (P<0.05) when compared to those fed 50% sundried brewer's dried grain. The values reported in this study were higher than the ether fibre digestibility reported by Mafimidiwo *et al*. (2022) for growing rabbits fed urea -molasses treated maize cob (78.46 - 85.59).

Table 3. Nutrient digestibility of grower pigs fed Sundried brewer's dried grain supplemented with enzyme

Parameters	T1 (0%)	T2 (50%)	T3 (100%)	SEM	p-value
Dry Matter digestibility	54.67[b]	82.00[a]	76.97[a]	2.47	0.00
Crude protein digestibility	52.00[c]	79.49[a]	71.99[b]	1.19	0.00
Crude fibre digestibility	46.33[b]	75.95[a]	76. 12[a]	1.69	0.00
Ether extract digestibility	62.33[b]	76.67[a]	69.00[b]	2.20	0.01

Means with different superscript on the same row are significantly different (P<0.05)

SEM: Standard error of mean

3.3 Haematological Parameters of Grower Pigs fed Sundried Brewer's Dried Grain Supplemented with Enzyme

The haematological parameters of grower pigs fed sundried brewer's dried grain supplemented with enzyme as shown in Table 4. The result showed significant (P< 0.05) effect of sundried brewer's dried grain supplemented with enzyme on the haematological parameters of grower pigs. The values of white blood cells, red blood cells, haemoglobin, haematocrit, MCV, MCH and MCHC in pigs fed sundried brewer's dried grain supplemented with enzyme ranges from 11.94 to 13.16, 5.47 to 5.93, 100.28 to 101.49, 31.27 to 32.70, 71.10 to 73.11, 25.16 to 27.01 and 367.89 to 370.10, respectively. The replacement with sundried brewer's dried grain supplemented with enzyme at 50% in the diet of pigs resulted in higher WBC and MCH. Diet supplemented at 100% sundried brewer's dried grain showed higher RBC, Haemoglobin, Haematocrit and MCHC. Pigs fed control diet resulted to higher MCV when compared to pigs fed diets supplemented

50% and 100% sundried brewer's dried grain. White blood cells value was lowest in the control diet (11.94) and were not different (P<0.05) when compared to WBC in pigs fed 50% and 100% sundried brewer's dried grain. The values of WBC increased to 13.16 in pigs fed 50% sundried brewer's dried grain supplemented with enzyme. WBC was lowest in pigs fed 100% sundried brewer's dried grain to 12.18. The WBC values were within the normal range of 7-20 (RAR, 2009). WBC values of 7.51-9.33 was reported in the work of Adesehinwa *et al*. (2007). This is inconsonance with the report of Ajuonuma and Uchendu (2013) who stated that, with increasing CPM inclusions, there were slight increase in the values of total white blood cells counts. White blood cells are critical in the defensive mechanism of pigs (Ojediran *et al*. 2020).

Red blood cells value was lowest in the control diet (5.47). RBC increased to 5.77 and 5.93 in pigs fed 50% and 100% sundried brewer's dried grain supplemented with enzyme respectively and were not different (P<0.05) when compared to WBC in pigs fed control diets. RBC was highest in pigs fed 100% sundried brewer's dried grain. The RBC values reported in this study were within the recommended RBC range of 5.0–10.0x10^6/mm^3 documented in Merck Manual (2012). The highest value of RBC count observed for pigs fed diet with 100% sundried brewer's dried grain and thus suggests improved availability of nutrients for efficient erythrocyte formation. Higher values in the range 7.31-8.16 was reported in the work of Ojediran et al. (2021).

Haemoglobin was lowest in the control diet (100.28 g/L) and were not different (P<0.05) when compared to haemoglobin in pigs fed 50% and 100% sundried brewer's dried grain. The values of haemoglobin increased to 101.49 in pigs fed 50% sundried brewer's dried grain supplemented with enzyme. The haemoglobin level decreased in pigs fed 100% sundried brewer's dried grain (100.38) when compared to pigs fed 50% sundried brewer's dried grain supplemented with enzyme. The HB values reported in this study were lower than the recommended HB range of 10-15g/dl documented in Merck Manual (2012). It was reported in the work of Olafadehan (2011) that the control had highest Hb followed by those with enzyme supplementation with the CPM-based di*et al*one having the least.

Haematocrit was lowest in the control diet (31.27). Haematocrit level increased to 32.11 and 32.70 in pigs fed 50% and 100% sundried brewer's dried grain supplemented with enzyme respectively and were not different (P<0.05) when compared to haematocrit in pigs fed control diet. Haematocrit level was highest in pigs fed 100% sundried brewer's dried grain. Since the values reported in this work was higher than the recommended 30%, it indicates adequate blood ion status in the pigs (Perri *et al*., 2016).

Mean corpuscular volume (MCV) was highest in the control diet (73.11). MCV level decreased with increasing level of diet supplementation and were not different (P<0.05) among all three diets. It decreased to 72.64 in pigs fed 50% sundried brewer's dried grain. Feed supplementation with 100% sundried brewer's dried grain resulted to the lowest MCV (71.10). Normal MCV in animal ranges from 52-62. The values reported in this study were higher than the recommended range.

Mean corpuscular haemoglobin (MCH) was lowest in the control diet (25.16) and was not different (P<0.05) when compared to MCH in pigs fed 100% sundried brewer's dried grain but differ significantly (P<0.05) in pigs fed 50% sundried brewer's dried grain. MCH level increased to 27.01 in pigs fed 50% sundried brewer's dried grain. Feed supplementation with 100% sundried brewer's dried grain resulted to lower MCH (25.22) but was higher than that in pigs fed control diet.

Mean corpuscular haemoglobin concentration (MCHC) was lowest in the control diet (367.89).

MCHC level increased to 369.08 and 370.10 in pigs fed 50% and 100% sundried brewer's dried grain supplemented with enzyme respectively and were not different (P<0.05) when compared to MCHC in pigs fed control diet. MCHC level was highest in pigs fed 100% sundried brewer's dried grain. The MCHC values reported in this work were higher than the normal MCHC range of 30-36 (RAR, 2009).

Table 4. Haematological paremeters of grower pigs fed Sundried brewer's dried grain supplemented with enzyme.

Parameters	**T1 (0%)**	**T2 (50%)**	**T3 (100%)**	**SEM**	**p-value**
White blood cells (L^{-1})	11.94	13.16	12.18	0.37	0.12
Red blood cells (L^{-1})	5.47	5.77	5.93	0.29	0.56
Haemoglobin (g/L)	100.28	101.49	100.38	0.39	0.13
Haematocrit (%)	31.27	32.11	32.70	0.57	0.28
MCV (fL)	73.11	72.64	71.10	1.26	0.53
MCH (pg)	25.16^{b}	27.01^{a}	25.22^{b}	0.36	0.02
MCHC (g/dL)	367.89	369.08	370.10	0.68	0.15

Means with different superscript on the same row are significantly different (P<0.05)

SEM = Standard error of mean; MCV = Mean corpuscular volume; MCHC = Mean corpuscular haemoglobin concentration; MCH = Mean corpuscular haemoglobin

3.4 Serum Biochemical Parameters of Grower Pigs fed Sundried Brewer's Dried Grain Supplemented with Enzyme

The serum biochemical parameters of grower pigs fed sundried brewer's dried grain supplemented with enzyme as shown in Table 5. The result showed significant (P< 0.05) effect of sundried brewer's dried grain supplemented with enzyme on the serum biochemical parameters of grower pigs. The values of cholesterol, glucose, urea, albumin, globulin, creatinine ranges in pigs fed sundried brewer's dried grain supplemented with enzyme ranges from 4.15 to 4.89, 5.42 to 6.30, 4.71 to 6.21, 27.16 to 28.58, 34.46 to 38.14 and 95.24 to 98.88, respectively. The replacement with sundried brewer's dried grain supplemented with enzyme at 100% in the diet of pigs resulted in higher cholesterol level.

Diet supplemented at 50% sundried brewer's dried grain showed higher urea, albumin, globulin and creatinine levels. Pigs fed control diet resulted to higher glucose when compared to pigs fed diets

supplemented 50% and 100% sundried brewer's dried grain. The cholesterol level was lowest in pigs fed control diet (4.15) and was not different (P<0.05) when compared to cholesterol in pigs fed 50% and 100% sundried brewer's dried grain. Diet supplementation with 50% and 100% sundried brewer's dried grain increased the cholesterol level of pigs to 4.20 and 4.89 respectively. The highest cholesterol was observed in pigs fed 100% sundried brewer's dried grain. Akande *et al*. (2015) observed that high ether extract may not translate to high cholesterol or fractions because it is crucial in homeostasis and in series of metabolic cycle. The glucose level was highest in pigs fed control diet (6.30) and was not different (P<0.05) when compared to glucose in pigs fed 50% and 100% sundried brewer's dried grain.

Diet supplementation with 50% sundried brewer's dried grain reduced the glucose level of pigs to 5.42. Further supplementation with 100% sundried brewer's dried grain increased glucose level to 6.13 but it was observed to be lower than glucose level of pigs fed control diet. However, the normal and slightly higher blood glucose levels obtained for sundried brewer's dried grain diets and maize based diet respectively indicated that the pigs were not surviving at the expense of body tissues (Ologhobo *et al*., 1992).

The level of urea in pigs fed control diet was the lowest (4.71) and was different (P<0.05) when compared to urea in pigs fed 50% and 100% sundried brewer's dried grain. Diet supplementation with 50% sundried brewer's dried grain increased the urea level of pigs to

6.21 making it the highest. Urea was lower in pigs fed 100% sundried brewer's dried grain (5.81). Adesehinwa et al. (2008) reported that high serum urea was an indication of muscular wastage in animals. Increased serum urea concentration may suggest an increase in activities of urea enzymes: - ornithine, carbonyl transferase and orginase which may also indicate kidney damage (Unigwe *et al*., 2016).

Albumin level was lowest in pigs fed control diet (27.16g/L) and was not different (P<0.05) when compared to albumin in pigs fed 50% and 100% sundried brewer's dried grain. Replacement of diets for pigs with 50% sundried brewer's dried grain gave the highest albumin

(28.58). Replacement of sundried brewers grain at 100% slightly reduced the albumin level in pigs to 28.47 but was higher than those for pigs fed control diet.

Globulin level was lowest in pigs fed control diet (34.46 g/L) and was not different (P<0.05) when compared to globulin in pigs fed 50% and 100% sundried brewer's dried grain. Replacement at 50% sundried brewer's dried grain gave the highest globulin.

(38.14). Replacement at 100% sundried brewer's dried grain resulted in decrease in the gobunin level in pigs (36.11 g/L).

Creatinin level was lowest in pigs fed control diet (95.24g/L) and was not different (P<0.05) when compared to creatinin in pigs fed 50% and 100% sundried brewer's dried grain. Replacement of sundried brewer's dried grain at 50% gave the highest creatinin (98.88). Replacement with 100% sundried brewer's dried grain resulted to decrease in the creatinin level in pigs (95.69). This is in line with the results of Amaefule *et al*. (2006) who had no significant difference (P>0.05) as well as having values fell within normal physiologic values.

Table 5. Serum biochemical parameters of grower pigs fed Sundried brewer's dried grain supplemented with enzyme.

Parameters	**T1 (0%)**	**T2 (50%)**	**T3 (100%)**	**SEM**	**p-value**
Cholesterol	4.15	4.20	4.89	0.31	0.24
Glucose	6.30	5.42	6.13	0.37	0.27
Urea	4.71^{c}	6.21^{a}	5.81^{b}	0.11	0.00
Albumin	27.16	28.58	28.47	0.56	0.22
Globulin	34.46	38.14	36.12	1.34	0.23
Creatinin	95.24	98.88	95.69	1.65	0.31

Means with different superscript on the same row are significantly different (P<0.05)

SEM: Standard error of mean

4.0 CONCLUSIONAND RECOMMENDATIONS

4.1 Conclusion

Compared to pigs fed a maize diet, the sundried brewer's dried grain supplemented with enzymes improved the pigs' crude fibre, dry matter, crude protein, and ether extract digestibility. It also improved the pigs' WBC, MCH, RBC, Haemoglobin, Haematocrit, MCHC, urea, albumin, globulin, and creatinine levels, but had no effect on their MCV, cholesterol, or glucose levels..

4.2 Recommendations

This study recommends the use of 50% sundried brewer's dried grain supplemented with enzyme in pig diets because of superior nutrient digestibility, haematological and serum biochemical parameters.

REFERENCES

Adebiyi, O. A., Adeshola, A. T., Ekeh, C. C., & Olumide, M. D. (2020 Growth Performance, Digestibility and Gut Morphology of Grower Pigs fed Diets Substituted with Watermelon Waste. *Animal Nutrition and Feed Technology*, *20*(1), 61-70.

Adesehinwa, A. O. K. (2007). Utilization of Palm Kernel Cake as a Replacement for Maize in Diets Growing Pigs: Effects on Performance, Serum Metabolites, Nutrient Digestibility and Cost of Feed Conversion. *Bulgarian Journal of Agricultural Science,* 13 (5) 593600.

Adesehinwa, A. O. K., Dairo, F. A. S. and Olagbegi, B. S. (2008). Response of Growing Pigs to Cassava Peel Based Diets Supplemented with Avizyme R 1300: Growth, Serum and Haematological Indices. *Bulgarian Journal of Agricultural. Science,* 14(5): 491-499.

Ajuonuma, C. O. & Uchendu, C. I. (2013). Effect of Processed Cassava Peel Meal On The Haematology Of Pullets. *Journal of Agriculture and Veterinary Science*, 6(3): 27-29.

Akande T.O., Akinwumi A.O. & Abegunde T.O. (2015). Cashew reject meal in diets of laying chickens: nutritional and economic suitability. *Journal of Animal Science and Technology*, 57: 1–

Amaefule, K. U., Okechukwu, S. O., Ukachukwu, S. N., Okoye, F. C. & Onwudike, O. C. (2006). Digestibility and nutrient utilization of pigs fed graded levels of brewer's dried grain based diets. *Livestock research for Rural Development (LRRD*) 18:1.

Amoah, K.O., Asiedu, P., Wallace, P., Bumbie, G.Z. & Rhule, S.W.A. (2017). The performance of pigs at different phases of growth on sun-dried brewers spent grain. *Livestock Research for Rural Development,* (29) 90.

AOAC. Association of Official Analytical Chemists. Official Methods of Analysis, (1990).

Babarinde, O. E., Adebiji, O. A., Longe, O.G. and Ojebiyi, O.O. (2020). Growth Performance, Nutrient Utilization of Brewers Dried grain and Sorghum Spent Grain (Burukutu Residue) by Broiler Chickens. *International Journal of Research in Agricultural Science.* Vol.7;1, ISSN: 2348-3997

Baker, F.J. & Silverton, R.F. (1985).*Introduction to Medical Laboratory Technology*. 6 edition. Butterworth, England. Pp. 120- 128.

Becker, D., Bakuradze, T., Hensel, M., Beller, S., Yélamos, C. & Richling, E. (2021) Influence of Brewer's Spent Grain Compounds on Glucose Metabolism Enzymes. *Nutrients*, 13, 2696.

Boontiam, W., Hong, J., & Kim, Y. Y. (2022). Dietary Brewer Grain Meal with Multienzymes Supplementation Affects Growth Performance, Gut Health, and Antioxidative Status of Weaning Pigs. *Fermentation*, *8*(2), 80.

FAO. (2011). Livestock in Food Security. Food and Agricultural Organization of the United Nations, Rome, Italy. *World Livestock*

FAO. (2013). Food Wastage Footprint: Impacts on Natural Resources. Food and Agricultural Organization of the United Nations, Rome, Italy.

Ikram, S., Huang, L., Zhang, H., Wang, J., & Yin, M. (2017). Composition and Nutrient Value Proposition of Brewers Spent Grain. *Journal of Food Science*, 82, 2232–2242.

Kagira, J.M., Kanyari, P.W.N., Maingi, N., Githigia, S.M., Ng'ang'a, J. C. & Karuga, J.W. (2010). Characteristics of the smallholder free-range pig production system in Western Kenya. *Tropical Animal Health*, 42: 865-873.

Mafimidiwo, A. N., Williams, G. A., Olayemi, W. A., Adesanya, O. F., Muhammad, S. B., Rabiu, L. A. & Omofunmilola, E. O. (2022). Influence of Dietary Replacement of UreaMolasses

Treated Rice Husk for Wheat Offal on Serum and Haematological Parameters of Growing Pigs. *Journal of Global Biosciences*, 11(10), 9455-9467.

Martin, D.S., Orive, M., Iñarra, B., Castelo, J., Estévez, A., Nazzaro, J., Iloro, I., Elortza, F., & Zufía, J. (2020). Brewers' Spent Yeast and Grain Protein Hydrolysates as SecondGeneration Feedstuff for Aquaculture Feed. *WasteBiomass-Valorization*, 11, 5307– 5320.

McDonald, T. P., Jones, D. D., Barret, J. R., Albright, J. L., Miles, G. E.,Nienaaber, J. A. & Hahn, G. L. (1988). Measuring the heat increment of activity of growing-finishing swine. *Transactions of the American Society of Agricultural Engineers*, 31:1180–1186.

Merck Manual, (2012). *Haematologic reference ranges. Mareck Veterinary Manual*. Retrieved from http://www.merckmanuals.com.

Mufwa, B. J., Kibon, A., Mafudi M., and Yakubu B. (2011). Effect of graded levels of BDG on the Performance of growing Rabbits,; Growth Performance and Economy of *Production. Journal of Sciences and Multidisciplinary research.*Vol.*3*

Ojediran, T., Oyebamiji, O., Areo, E., & Emiola, I. (2021). Growth parameters, economic analysis and blood characteristics of weaned pigs fed cashew reject kernel meal. *Polish Journal of Natural Sciences*, *36*(2), 131-145.

Ojediran, T.K., Olayiwola, S., Adeyeye, M., Ajayi, A. F. & Emiola I.A. (2020). Effects of palm kernel meal-based diet with or without enzyme supplementation on growth performance, economic benefits and villi morphometry of weaned pigs. *Polish Journal of Natural Sciences*, 35(2): 129–139.

Olafadehan, O. A. (2011). Haematological parameters, serum constituents and organ development of growing rabbits as affected by feeding processed cassava peels. *Animal Nutrition and Feed Technology*, 11: 41-51.

Olawale, O., & Confidence, C. L. (2021). Health risk assessment of pesticide residues in bean samples from Wukari, Taraba State, Nigeria. *Journal of Environmental Chemistry and Ecotoxicology*, *13*(1), 1–13.

Ologhobo, A. D., Apata, D. F., Oyejide, A. & Akinpelu, R. O. (1992). Toxicity of raw Lima beans (Phaseolus lunatus) and Lima bean fractions for growing chicks. *British Poultry Science*, 34:505-522.

Osaro, O.M. (1995). Enhancing production performance of small holder pig farmers. In: *Pig Production Workshop Training Manual*. National Agricultural Extension and Research Liaison Services, Ahmadu Bello University, Zaria, Nigeria, 100-130.

Perri, A.M., Friendship, R.M., Harding, J.S.C. & O'Sullivan, T.L. (2016). An investigation of iron deficiency and anemia in piglets and the effect of iron status at weaning on postweaning performance. *Journal of Swine Health and Production*, 24(1): 10–20

Tegbe, T. S.B., Jegede, J.O. & Adama, I. S. (1992). The Effect of Feeding Palm Kernel Meal (PKM) Without Synthetic Amino Acid Supplementation on Performance Characteristics of Young Pigs. Paper Presented at the 17th Annual Conference Nigerian Society of Animal Production. Sheraton Hotel and Towers, Abuja, Nigeria.

Unigwe, C. R., Marire, B. N., Omeke, B. C. O., Abonyi, F. O., Oladipo, T. A. and Adebayo, D. M. (2016). Effects of maize-replaced fermented cassava peels and enzymesupplemented diet on haematology and serum biochemistry of cross-bred female pigs. *International Journal of Advanced Research in Biological Sciences*, *3*(6), 198208.

Wafar, R. J., Tarimbuka, L. I., Sini, T., Adi, Z. A., Lamalang, E. B., and Bako, M. I. (2020). Growth performance and nutrient digestibility of weaner pigs fed cereal offals in diets. *Nigerian Journal of Animal Production*, *47*(6), 129-134.