

GUT BALANCE BOOSTERTM AS A PROSPECTIVE ALTERNATIVE TO ANTIBIOTICS IN SWINE DIET.

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ABSTRACT

This study accessed the effects of dietary inclusion of Gut Balance BoosterTM (GBB) on performance of weanling pigs. Twenty four six week old weaned pigs of mixed sexes were randomly assigned into two groups of 12 piglets each. They were fed diet A (normal starter diet without GBB) and diet B (starter diet with GBB at 200g/kg). Feed intake, weight gain, feed conversion ratio (FCR), haematology, serum lipid profile, faecal egg count, shedding of selected bacteria and cost-benefit of the additive were determined. Results showed that there was no significant difference ($p \leq 0.05$) in daily feed intake, FCR and weight gain. However, the values favoured the supplemented group (1.16 ± 0.10 vs. 1.06 ± 0.13 kg; 2.61 ± 0.34 vs. 3.04 ± 0.23 ; 485.29 ± 59.12 vs. 355.00 ± 40.30 g). Haemoglobin, PCV, RBC and WBC and Lymphocyte counts were higher in group B. Lipid profile showed no significant difference ($p \leq 0.05$) in the two groups. The GBB reduced faecal strongyle eggs output, *salmonella* species and increased *Bacillus subtilis* and *Escherichia coli*. Net gain due to GBB supplementation within the experimental period was ₦221,508 (\$613.60). It was concluded that in pigs, dietary inclusion of GBB at starter phase improves gut health, growth performance and is cost beneficial.

Keywords: Swine, antibiotics, feed additives, growth performance, cost benefits.

INTRODUCTION

Antibiotics are used in animal feed to maintain and improve animal performance and prevent /control enteric pathogens (FAO, 2016). However, consumption of the animal products can result in bacterial resistance in human pathogens and this led to its ban in 2006 by the European Union. Following this ban, researches focused on developing alternative to antibiotic feed additives to enhance livestock performance (Thacker, 2013). Organic acids, enzymes, probiotics, prebiotics, antimicrobial peptide and phytogenic compounds have widely been recognized as potential alternatives (Yang *et al.*, 2015). Strong odour, poorly understood mode of action, complex chemical composition, unpredictable effects of individual compounds, low availability and stability in gastrointestinal tract limit the use of feed additives singly, particularly the phytogenics (Stevanović, 2018). Gut Balance BoosterTM (GBB) contains Zinc, Benzoic acid, Calcium, Sodium butyrate and essential Oils. According to the manufacturer, in broilers, where it is recommended to be used within the first 35 days of life, it supports gut health by stimulating the growth of gut microvilli, and excretion of enzymes that improves nutrient absorption. The objective of this study was to assess if dietary inclusion of GBBTM could serve as an alternative to antibiotics growth promoter in swine diet.

MATERIALS AND METHODS

Experimental animals, husbandry and diet

Experimental animals comprised 24 weanling pigs of mixed sexes, progeny of three sows and one boar and aged six weeks. They weight ranged between 8.50 to 10.00kg. They were acclimatized for two weeks during which they were identified and given some prophylactic treatment. The experimental diet was formulated using following NRC (1998) nutritional requirements for swine.

Animal care:

Animal studies were carried out following the guideline of the ethical procedure of the Animal Use and Care Committee of the Faculty of Veterinary Medicine, University of Nigeria (FVM-UNN-IACUC-2019-056).

Experimental design:

Following the acclimatization period, the 24 animals were randomly divided into two groups A and B with 12 piglets in each. They were fed diet A (normal starter diet without GBB) and diet B (starter diet with GBB at 200g/kg).

Daily feed was determined as the difference between amount of feed fed and the amount left over in 24 hours while the feed conversion ratio (FCR) was determined by dividing feed intake by weight gained within the same period.

Packed cell volume pigs was determined by microhaematocrit method (Coles, 1986), Haemoglobin concentration was determined by the cyanomethemoglobin method (Jain, 1986) using SP6-500UV spectrophotometer (PYE UNICAM, England). Red blood cell and total WBC counts were enumerated using the Leishman stained blood smear and the different cells of the leucocytes series counted by the longitudinal counting method. The total and differential leukocyte counts, and red blood cell counts were carried out using an improved Neubauer haemocytometer method (Coles, 1986). The lipid profile which include LDL, H DL, VLDL, Triglycerides and Cholesterol were determined using Biosystemtest kits (Biosystem, S.A Costa Brava 30 Barcelona, Spain).

The faecal egg count was done using faecal floatation technique. Where large egg numbers were involved, McMaster technique was employed for quantitative analysis. Microbial populations were determined by serial dilution (10^{-1} to 10^{-10}) in anaerobic diluent before inoculation onto petri dishes of sterile agar and enumerated as previously described (Singleton, 2004). Cost-benefit analysis (CBA) was carried out using cost benefit ratio (BCR); a basic financial tool.

Statistical

Statistical analyses were done using the SPSS program (SPSS Inc., Chicago, IL). Data from the study was analyzed with Independent t-test between the groups. Level of significance was taken as $p \leq 0.05$.

Results

There was no significant difference ($p \leq 0.05$) in the performance output of the weanling pigs fed with Gut Balance BoosterTM supplemented diet when compared to the control group. However, the values from feed intake, weight gain, FCR, and final body weight were higher in the test group. There was no significant difference ($p \geq 0.05$) in the haematological profile of the pigs. However, the values obtained in HB, PCV, RBC and WBC count, and Lymphocyte counts were also higher in group B. Triglycerides, LDL and VLDL were higher in the test group than group A. The GBB reduced faecal strongyle eggs output (106.00 - 0.00epg), *salmonella species* (4.9×10^4 - 2.9×10^4 cfu/ml) and increased *Bacillus subtilis* (1.4×10^4 - 2.8×10^4 cfu/ml) and *Escherichia coli* (2.7×10^4 - 3.1×10^4 cfu/ml). Net revenue due to GBB supplementation within the experimental period was ₦221,508 (\$613.60).

DISCUSSION

This study revealed that growth performance of the supplemented group was better compared to the control group. This is in line with the observation of Bühler (2009) that showed that dietary benzoic acid had an influence on fattening duration, though comparative analysis did not result in statistical significance. Optimal performance is only possible when enough nutrients are absorbed. The antimicrobial effect of organic acids can reduce the microbial population in the gut and thus competition for nutrients (Richards *et al.*, 2005). The growth performance in this experiment is also in line with Han and Thacker (2010) who demonstrated more rapid growth for pigs fed with Zinc oxide supplemented diet. This data supports previous studies which demonstrated that pharmacological doses of zinc oxide stimulate performance in weanling pigs (Hill *et al.*, 2000). Similarly, the study revealed that growth performance of the supplemented group was better compared to control group This is in line with the observations of other researchers that have shown the beneficial health effects of combining probiotic and Sodium

butyrate to have positive effects on livestock production parameters such as weight gain, feed intake, and FCR (Abonyi 2018). Dietary content can affect the blood profile of healthy animals. The determination of haematological indices in this study was to determine any possible negative effects of the additive including leucogram abnormalities. This was in line with the report of Isaac *et al.* (2013) that hematological components which consist of RBCs, WBCs or leucocytes, platelets, haemoglobin and are valuable in monitoring food toxicity as well as the health status of farm animals. Values for haematological profile studied were within normal range for pigs. In like manner, probiotics were reported to have no adverse significant effect on the erythrocytes, PCV, haemoglobin concentration, MCV, MCH and leucocytes of rabbit (Ezema and Eze, 2010).

The lipid profile showed a reduction in values of cholesterol and triglycerides in the treatment group compared to the control. The work is in line with Favier *et al.* (1995), who reported reduced cholesterol levels in experimental guinea pigs.

According to Ooi and Liong (2010), feed additives such as probiotic and/or prebiotics have been widely assessed for their effects on lipid profiles of livestock such as total cholesterol, LDL, HDL and triglycerides. However, not all trials have yielded conclusive results as was observed in this trial.

In this study, GBB recorded some anthelmintic effect. To the best of our knowledge no other study has shown that this additive or its components reduce helminth burden in pigs.

This is a pioneer work done with GBB on weanling pigs and hence, is the first time the use of the additive has been put under cost benefit analysis. The result obtained however showed a significant increase in the profit margin, giving a net gain due to its dietary inclusion in pig starter diet to be ₦221,508 (\$613.60).

CONCLUSION.

Diet B stimulated more positive influence on the production parameters we investigated by improving their gut health through reducing harmful and increasing beneficial bacterial load and anthelmintic effect. This suggests that GBB could be an alternative to antibiotic growth promoter in weanling pigs. More studies are recommended to elucidate GBB's appropriate inclusion level and potentials in reducing worm burden in pigs.

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