

Effects Of Graded Levels Of Garlic (*Allium Sativum*) On Some Blood Parameters Of Growing Pigs

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Abstract: Effect of graded levels of garlic was investigated on some blood parameters of growing pigs. 36 growing landrace pigs of average body weight (BW) of 23 ± 0.7 (mean \pm SD) kg were used in the study. Pigs were assigned to six dietary treatments in a completely randomized design (CRD). The trial lasted for four weeks (28d). The dietary treatments were: diet 1, control diet (0g garlic/kg of diet), whereas diets 2-6 contained garlic at: 10g, 20g, 30g, 40g and 50g/kg of diet, respectively. Each dietary treatment was assigned to 6 pigs. At the end of the study period blood samples were humanely collected from all pigs into EDTA treated tubes and immediately snaps frozen. Packed cell volume (PCV), red blood cell (RBC), haemoglobin (Hb), total white blood cell (WBC) counts and their differentials for each treatment group were analyzed. Garlic had no effect on RBC as there were no significant ($P > 0.05$) differences amongst treatment groups. Similarly, garlic had no significant ($P > 0.05$) effects on Hb and PCV. However, there were tendencies for better Hb and PCV values for the garlic-diets as their values were numerically higher compared with diet 1 (the control group). These were also mirrored for the WBC counts, the lymphocytes (LYM) and monocytes (MON). There were no significant ($P > 0.05$) differences for neutrophils (NEU) and eosinophils (EOSI). It was concluded that garlic had no effects on blood parameters of the growing pig. However, garlic marginally increased Hb, PCV, WBC and LYM values which might be important in reducing the susceptibility of the pig to environmental stressors as well as sudden death syndrome.

Key words: Blood parameters, Garlic and Pig

Introduction

Blood parameters are often used as one of the major indices to assess the physiological, pathological as well as the nutritional status of an organism, including the pig. Accordingly, changes in the blood constituents or concentrations of the different components of the blood can be used to understand the metabolic status of the animal and thus the animal overall health status [1; 6]. [3] showed that blood parameters, such as RBC, WBC, Hb, PCV as well as WBC and its differentials assay are routine nutritional and management strategies in monitoring and assessing animal physiological disposition to their nutrition and environment. Garlic has been demonstrated to improve the sensory properties of pork [2]. [7] studied the effects of garlic on some hematological and biochemical parameters of rats and showed that at 200mg dose of garlic per day for 30 days had no effect on the red blood cell count and packed cell volume of rats. However, dose of garlic of 100mg per day for 30 days increased red blood cell count and packed cell volume. Furthermore, at 100mg per day for 30 days also increased total white blood cell count, neutrophil and lymphocyte counts. In that study, it was concluded that garlic promoted leucopoiesis and increased neutrophil to lymphocyte ratio. To our knowledge there are no such data in swine studies. Therefore, the objectives of this study are to investigate the effects of graded levels of dietary garlic on the RBC, Hb, and PCV, WBC and its differentials, namely: NEU, LYM, MON and EOSI of the growing pig, respectively.

Materials and Methods

Animals, Housing and Management

Thirty six (36) growing pigs of similar age with average initial body weight (BW) of 23 ± 0.7 (mean \pm SD) kg were acquired from Songhai farm, Tai, Rivers State. The pigs on arrival at the Animal Wing of the Department of Animal Science, Rivers State University were randomly assigned to pens. The animals were fed a commercial grower diet for a 7-day adaptation period with water provided ad libitum. At the end of the adaptation period, six pigs were randomly assigned to each of six experimental diets and fed 5% of BW (as-fed basis) twice daily at 0900 h (half of the daily meal) and 1600 h, respectively. Animals had unlimited access to drinking water. Feed disappearance was closely monitored daily and animals were seen to consume their daily rations without orts. Animals received their assigned diets for a total of 28 d. Animal pens were cleaned regularly to ensure their comfort. Overall, the cares of the animals during the experimental period were in compliance with standard procedures.

Experimental Diets and Design

A standard corn-soybean meal-based diet that was formulated to meet or exceed the [6] recommended nutrient levels for 20 to 50 kg BW pigs were used in the study. Diet 1 was the negative control diet (devoid of garlic) while diets 2 – 6 contained garlic at different dietary concentrations. The diets were formulated to be isocaloric (DE 3,525 kcal/kg) and isonitrogenous (20% crude protein) but differed in their dietary garlic contents as: diet 1 (control; 0 g garlic/kg of diet); diet 2 (10 g garlic/kg of diet); diet 3 (20 g garlic/kg of

diet); diet 4 (30 g garlic/kg of diet); diet 5 (40 g garlic/kg of diet) and diet 6 (50 g garlic/kg of diet), respectively. The experiment was designed and carried out as a completely randomized design (CRD) with dietary treatments as the source of variation.

Experimental Procedures

At the beginning of each day in the week the different diets were weighed into individual pen feeders and then closely monitored its disappearance. Diets were offered at 5% of BW. On the last day of the study, blood samples were collected from all the animals by standard laboratory procedures into EDTA treated tubes between 8 and 9 a.m. and snap frozen for later analyses. PCV, RBC count, Hb concentration, total and differential WB counts of each sample group were analyzed for using hematology auto-analyzer machine (BC-2300).

Statistical Analysis

The experimental data were analyzed as a CRD. Data were subjected to analysis of variance (ANOVA) using PROC GLM of SAS (SAS Inst. Inc., Cary, NC) according to the experimental model: $Y_{ij} = \mu + D_i + E_{ij}$; where Y_{ij} is the observation, μ = overall mean common to all treatments, D_i = the effect of the i^{th} diet and E_{ij} = the error term. Means were compared using Tukey's test and α -level of 0.05 was used for all statistical comparisons to represent significance.

Results and Discussion

All animals in each dietary treatment group ingested their rations normally and were seen to grow throughout the experimental period as there were increases in their individual weights at the end of the study period. The results of RBC count, Hb concentration and PCV are shown in Table 1.

Table 1. RBC count, Hb concentration and PCV of pigs fed varied levels of dietary garlic

Item	DIETS						SEM	P-value
	Diet 1 n = 6	Diet 2 n = 6	Diet 3 n = 6	Diet 4 n = 6	Diet 5 n = 6	Diet 6 n = 6		
RBC ($\times 10^9/l$)	4.3	4.4	4.8	4.5	4.5	4.6	0.08	1.0
Hb (g/dl)	13.1	13.3	13.8	13.5	13.9	13.8	0.23	0.09
PCV (%)	37.0	37.4	38.6	37.9	37.8	37.6	0.7	0.08

SEM = standard error of the mean.

Dietary garlic had no effects ($P > 0.05$) on RBC counts, Hb concentration and PCV. The mean values of RBC, Hb and PCV in all groups were similar as there were no significant differences ($P > 0.05$) amongst treatment groups.

Nevertheless, there were tendencies for increased levels of Hb and PCV for the garlic-based diets. The results of the changes in the WBC counts and its differentials are shown in Table 2.

Table 2: Total and differential WBC counts in pigs fed varied levels of dietary garlic

Item	DIETS						SEM	P-value
	Diet 1 n = 6	Diet 2 n = 6	Diet 3 n = 6	Diet 4 n = 6	Diet 5 n = 6	Diet 6 n = 6		
WBC ($\times 10^9/l$)	9.5	12.4	13.3	13.6	13.4	13.2	1.44	0.08
NEU (%)	24.0	20.3	18.0	18.6	18.6	18.0	2.18	0.10
LYM (%)	72.0	76.3	79.0	79.0	79.0	80.0	1.12	0.06
MON (%)	2.0	1.4	1.3	1.4	1.4	1.0	0.18	0.09
EOSI (%)	2.0	2.0	1.7	1.0	1.0	1.0	0.17	0.10

SEM = standard error of the mean; WBC = white blood cell, NEU = neutrophil, LYM = lymphocytes, MON = monocytes and EOSI = eosinophil

There were no significant differences ($P > 0.05$) among treatment groups for the WBC counts. However, animals that received garlic in their diets demonstrated tendencies for increased WBC counts compared with the control. There were no significant differences ($P > 0.05$) among groups for NEU as their concentrations were similar for all treatment groups. There were no significant differences ($P > 0.05$) for LYM, but as was with WBC counts animals that received garlic in their diets had tendencies for higher levels of LYM compared with the control group animals. Although, there were no significant ($P > 0.05$) differences in MON among animals in all treatment groups there was a tendency for higher levels of MON for the control group compared with the animals on dietary garlic group animals. There were no differences ($P > 0.05$) in EOSI for all treatment groups. The results of studies with garlic on blood parameters in the literature have not been very consistent. This might not be unrelated with the nature and bioactive compounds in the garlic species used in those studies. To this end therefore, [5] had observed that due to the different concentrations of

allicin and alliin in the species of garlic in those studies the inconsistencies associated with studies involving garlic should not be surprising; as those findings could be as a result of the different concentrations of allicin and alliin the bioactive compounds of garlic. These views of [5] were previously demonstrated by [8]. In this current study, garlic demonstrated no effect on the RBC but tended to increase those of Hb and PCV, respectively. Similarly, garlic also tended to increase WBC counts and LYM concentrations. These observations are in agreement with those of [9]. This attribute of garlic is a further confirmation that garlic stimulates immune functions [10]. Furthermore, this attribute of garlic can be used to partly explain the role of garlic in activating the natural killer cells, the function of T-lymphocytes [4], [10]. Conversely, the animals on the control diet in this study had a trend for increased monocytes compared with the garlic-containing diets. This might likely be an indication that animals on the control diet would have experienced a challenge, such as environmental stressor since monocytes are principally responsible for ingesting

dead and damaged cells and help defend against infectious organisms [5].

Conclusion

It was concluded that garlic had no effects on blood parameters of the growing pig. However, garlic tended to increase Hb, PCV, WBC and LYM concentrations in the pig. This is important in reducing the susceptibility of the pig to environmental stressors and as such can help to protect the pig against sudden death syndrome, thereby aiding the pig farmer increase his profit margin.

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