Scholarly Journal of Agricultural Science Vol. 7(2), pp. 57-61 March, 2017
Available online at http:// www.scholarly-journals.com/SJAS
ISSN 2276-7118 © 2017 Scholarly-Journals

Full Length Research Paper

Growth performance and blood parameters of weaner pigs fed diets supplemented with turmeric powder

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Accepted 8 March, 2017

A total of Twenty four (24) six weeks old weaned cross bred male pigs (Landrace × Duroc) were used to investigate the growth performance and blood parameters of weaner pigs fed diets supplemented with turmeric. The pigs were randomly divided into four groups of six (6) each and the groups were randomly assigned to four diets containing four levels at 0%, 2%, 4% and 6% of turmeric powder (TUP). Each treatment was replicated 3 times with 2 pigs per replicate in a Completely Randomized Design (CRD). The trial lasted for 56days. The growth performance measured were feed intake, body weight gain and feed conversion ratio and the hematological parameters evaluated are Red blood cell count (RBC), Hemoglobin (Hb), White blood cell count (WBC), Pack cell volume (PCV), Mean corpuscular volume (MCV), Mean corpuscular hemoglobin (MCH) and Mean corpuscular hemoglobin concentration (MCHC). Results showed that dietary turmeric powder (TUP) inclusion significantly (P<0.05) improved the final live weight, the feed conversion ratio and reduction in feed cost per kg weight gain in the animals. The feed intake were not significantly (P>0.05) different among the dietary treatments and none of the hematological parameters were significantly (P>0.05) affected. It was concluded based on the data from feed intake, final live weight, feed conversion ratio, feed cost per kg and the haematological indices evaluated that turmeric powder (TUP) could be incorporated up to 6% level in weaner pig ration.

Key words: Weaner pigs, feed intake, feed conversion ratio, growth performance.

INTRODUCTION

Antibiotics are naturally occurring, semi – synthetic and synthetic compounds of antimicrobial activity used in human and veterinary medicine to treat and prevent disease, and for other purposes including growth promotion in food animals. However, there have been a ban on the use of antibiotics (Synthetic) as growth promoters in many countries because of its adverse effect on animal ,their residues in animal products and the development of antibiotic resistance in bacteria (Lee et al., 2004). More studies now look for alternatives for antibiotics in order to eliminate their impact on animals (Yang et al., 2009). According to Burt (2004) herbs and spices are identified to exert potent antimicrobial properties in vitro against pathogens, and as alternative feeding strategy to replace antibiotic growth promoters.

Turmeric is a rhizomatous herbaceous perennial herb of the ginger family; it is cultivated in many parts of the world such as India, Pakistan, China, Malaysia, Indonesia, Jamaica and Peru (Govindarajan and Stahl, 1980). Turmeric powder is a bright yellow powder made from dry grinding of turmeric rhizomes. According to Chattopadhyay et al (2004) turmeric contains 6.3% protein, 5.1% fat, 13.1% moisture, 69.4% carbohydrates and 3.5% minerals. Its yellow pigment (Curcumin) has a high therapeutic value; several reports have shown that 2-5% turmeric is curcumin (Agarwal et al, 2001) and it's relatively rich in starch (Mangalakurmari and Mathew, 1986). Curcumin are excellent source of phenolic compounds, ascorbic and carotenoids which have been reported to show good antioxidant activity (Huda-faujan et al, 2009; M. Kamal et al, 2014).

Turmeric extracts have been reported to have effect as anti-microbial (Dixit et al, 1988), antioxidant (Joe et al, 1997; Babu and Srinivasan, 1997), anti-inflammatory and anticancer agents (M. Kamal, 2014; South et al, 1997). Several researches has been carried out on the effect of supplementing turmeric in the diet of different livestock's most of which the results are not consistent, therefore,

Table 1: Percentage composition of experimental diets.

Ingredients	Diets			
	1	2	3	4
Maize	30.0	30.0	30.0	30.0
Wheat offal	25.0	25.0	25.0	25.0
Brewers dry grain (BDG)	19.0	17.0	15.0	13.0
Soya meal	10.0	10.0	10.0	10.0
Groundnut cake	5.00	5.00	5.00	5.00
Palm kernel meal	5.00	5.00	5.00	5.00
Bone meal	4.00	4.00	4.00	4.00
Lysine	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Turmeric Powder (TUD)	0.00	2.00	4.00	6.00
Total	**100**	**100**	**100**	**100**
Calculated composition				
Crude protein (%)	18.13	18.05	18.06	18.07
Crude fibre (%)	5.94	6.22	6.23	6.24
Energy (ME kcal/kg)	2433.0	2437.5	2439.9	2440.1

Premix supplied per kg diet :- Vit A, 15,000 I.U; Vit E, 5mg; Vit D3, 3000I.U, Vit K, 3mg; Vit B2, 5.5mg; Niacin, 25mg ; Vit B12, 16mg ; Choline chloride, 120mg ; Mn, 5.2mg ; Zn, 25mg ; Cu, 2.6g ; Folic acid, 2mg ; Fe, 5g ; Pantothenic acid, 10mg ; Biotin, 30.5g ; Antioxidant, 56mg

the objective of this study was to investigate the effects of supplementing turmeric powder on the growth performance and blood profile of weaner pigs.

MATERIALS AND METHODS

Site of the experiment

The study was carried out at the Piggery unit of Dan-malafia Research Farms, Ibadan, Nigeria.

Preparation of Turmeric Powder

The turmeric rhizome (dry roots) were collected, sun-dried for 8 days and milled to produce turmeric powder (TMP). Thereafter TMP was used to formulate diet along with other ingredients purchased from a reputable feed mill in Ibadan.

Experimental diets

Four diets were formulated to contain 0, 2, 4 and 6% levels of Turmeric powder respectively. The ingredients and chemical composition of the diets is shown in table 1.

Animals and experimental design

Twenty four, 6 weeks old weaned cross bred male pigs (landrace × Duroc) with an average weight of 5.97-6.67kg were randomly assigned to four dietary treatments of six (6) pigs per group in a Completely Randomized Design (CRD). The pigs were individually housed in a pen measuring (50×75cm) which was disinfected one month before the arrival of the animals. On introduction, the animals were given anti-stress added into their clean drinking water. The pigs were allowed one pigs were allowed one week adjustment period during which they were feed with the control diet and given prophylactic treatment of Ivomec at 0.5ml per pig subcutaneously against endo and ecto-parasites before they were placed on the experimental diets. Records of live weight changes were by weighing at the beginning of the experiment and at weekly intervals throughout the experiment, weight gain was determined as the difference between the weight of the previous week and that of the present week. Feed intake was determined by the weigh back technique, feed conversion ratio was obtained by dividing feed intake by the weight gain, the cost of the Kg feed was calculated using the market price of the ingredients used in the formulations, and this was done throughout the experimental period which lasted for 56 days.

Blood Analysis

At the end of 8th week of the experiment blood samples were collected from three (3) randomly selected pigs per treatment via jugular vein. The blood samples meant for hematology was collected into an Ethylene diamine tetra acetic acid (EDTA) bottle, blood samples were labeled according to treatment and replicates. The samples were then taken to the laboratory to determine pack cell volume, hemoglobin concentration (Hb), Red blood cell count (RBC), White blood cell count (WBC), Mean corpuscular volume (MCV), Mean corpuscular

Table 2: Proximate Composition of Turmeric Powder.

Parameter	Dry matter (%)
Moisture	6.57
Crude protein	9.14
Ether extracts	2.40
Total ash	8.69
Crude fibre	4.10
NFE	69.10

NFE: Nitrogen Free Extracts

Table 3: Phytochemistry of Turmeric Powder.

Parameter	Quantity
Saponin (%)	1.03±0.02
Alkaloid (%)	0.66±0.00
Tannin (%)	1.01±0.01
Sterol (%)	0.02±0.01
Phenol (%)	0.72±.0.02
Flavenoid (%)	0.38±0.00

hemoglobin (MCH), Mean corpuscular hemoglobin concentration (MCHC) and white blood cell differentials which includes neutrophils, lymphocytes, eosinophils and monocyte. PCV was determined by the micro-haematocrit method (Dacie and Lewis, 1991), RBC, WBC and Hb were determined by the improved Neubauer haematocytometer and cyanomethemoglobin method respectively. MCV, MCH and MCHC were determined according to Jain (1986), neutrophils, eosinophils, lymphocytes and monocytes were determined by method described by Mitruka and Rawnsley (1977).

Laboratory Analysis

The standard method of AOAC (1990) was used to determine the proximate of Turmeric powder and the experimental diets.

Statistical Analysis

Data obtained were subjected to analysis of variance (ANOVA) and means were separated using Duncan Multiple Range Test as described by Steel and Torrie (1980).

RESULTS

Table 2 shows the proximate composition of Turmeric powder (TUP). The proximate component of TUP used in this study are 6.57%, 9.14%, 2.40%, 8.69%, 4.10% and 69.10% for moisture, crude protein, ether extracts, ash, crude fibre and nitrogen free extracts. The crude protein and fibre gradually increases as the inclusion level of turmeric powder increases. However, all the values fall within the National swine nutritional guide (NSNG, 2010). Table 3 shows the phytochemistry of TUP, the values of the parameters measured are 1.03%, 0.66%, 1.01%, 0.02%, 0.72% and 0.38% for saponin, alkaloid, tannin, sterol, phenol and flavenoid respectively.

The growth performance parameters as influenced by the diets are presented in Table 4. The average final live weight ranges between 10.04-12.36 kg. There was no significant difference (P>0.05) among the treatments in term of their final live weight. The average daily intake values are 890.7, 880.9, 878.7 and 876.3 (g/animal/day) for diets 1, 2, 3 and 4 respectively while those of the average daily weight gain are 298.41, 293.64, 291.82 and 289.81 (g/animal/day) for diets 1, 2, 3 and 4 respectively. The values obtained for the feed conversion ratio are 2.98%, 3.00%, 3.01% and 3.02% respectively for diets 1, 2, 3 and 4 respectively while the cost of feed per kg are 115.0, 110.6, 106.5 and 103.9 (₦) for diets 1, 2, 3 and 4.

The feed intake, feed conversion ratio and the feed cost per kg were not significantly affected (P>0.05) by the dietary inclusion of TUP. The value of the feed intake decreased from diet 1 to 3 after which the value increased in diet 4. The final live weight were significantly (P<0.05) influenced by different inclusion of TUP and mortality was recorded throughout the experimental period. Table 5 shows the values of the heamatological parameters investigated, pack cell volume (PCV) values obtained are 42.00%, 41.30%, 44.23% and 45.81% for diet 1, 2, 3 and 4 respectively while those of heamoglobin concentration are 12.53, 12.09, 11.14 and 11.39 (g/dl) for diets 1, 2, 3 and 4 respectively. The values obtained for red blood cell (RBC) are 6.22, 6.10, 6.12 and 5.98 (× 106mm3) for diets 1, 2, 3 and 4 respectively. The mean corpuscular volume (MCV) values obtained are 55.09, 51.11, 53.08, 52.51(fl) for diet 1, 2, 3 and 4 while those of

Table 4: Growth performance of Weaner pigs fed different levels of Turmeric powder .

	Diets				
Parameter	**1**	**2**	**3**	**4**	**SEM**
Number of Anim,als	6.0	6.0	6.0	6.0	-
Av. Initial live weight (kg)	6.10	6.27	6.38	6.53	-
Av. Final live weight (kg)	10.04	10.81	11.27	12.36	0.26
Av. daily feed intake (g/animal/day)	890.7	880.9	872.7	874.3	21.34
Av. daily weight gain (g/animal/day)	298.41	293.64	291.82	289.81	10.22
Feed conversion ratio	2.98	3.03	3.00	3.02	0.17
Feed cost/kg (N)	115.0	110.6	106.5	103.9	-
Mortality	0.00	0.00	0.00	0.00	-

Table 5: Heamatological parameters of weaning pigs fed varying levels of Turmeric powder

	Diets				
Parameter	**1**	**2**	**3**	**4**	**SEM**
Pack cell volume (%)	42.00	41.30	44.23	45.81	2.61
Hb conc. (g/dl)	12.53	12.09	11.44	11.39	1.34
RBC count (106mm3)	6.22	6.10	6.12	5.98	2.02
WBC count (106mm3)	15.09	14.98	14.80	14.76	2.11
MCV (fl)	55.09	51.11	53.08	52.51	2.31
MCH (pg)	18.67	18.81	18.03	18.30	1.71
MCHC (%)	31.04	32,45	30.07	31.70	2.58
Differential Count (%)					
Neutrophils	43.01	42.19	41.04	40.03	2.53
Lymphocytes	52.71	51.21	52.17	52.31	3.06
Moncocytes	4.18	3.25	3.37	3.52	0.34
Eosinophils	6.79	5.67	5.81	5.67	0.17

mean corpuscular heamoglobin (MCH) are 18.67, 18.81, 18.03 and 18.30 (pg) for diets 1, 2, 3 and 4 respectively. The pack cell volume (PCV), heamoglobin(Hb), red blood cell counts (RBC), mean corpuscular volume (MCV), mean corpuscular heamoglobin concentration (MCH) and mean corpuscular heamoglobin concentration (MCHC) were not significantly affected (P>0.05) by the dietary inclusion of TUP.

The white blood cell (WBC) values obtained are 15.09, 14.98, 14.80 and 14.76 (× 106mm3) for diets 1, 2, 3 and 4 while those of Neutrophils are 43.01, 42.19, 41.04 and 40.03 for diets 1, 2, 3 and 4 respectively. The lymphocytes values obtained are 52.17%, 51.21%, 52.17% and 52.31% for diets 1, 2, 3 and 4 while those of monocytes values are 4.18%, 3.52%, 3.37% and 3.52% for diets 1, 2, 3 and 4 respectively. WBC, neutrophils, lymphocytes, monocytes and eosinophils were not significantly (P>0.05) among the dietary treatments, although the values of the WBC slightly decreased from diet 1 to 4.

DISCUSSION

The significant difference (P<0.05) in the final live weight of the animals is a clear indication that TUP contains good percentage of protein, the results obtained during the proximate analysis of TUP agrees with the reports Rajib Chandra Das et al (2014) and Ikepeama et al (2014) on the nutritional composition of turmeric and its antimicrobial properties. The inclusion of turmeric in the diet of the pigs slightly reduces the daily feed intake from diet 1 to 4 but did not affect the final live weight, this agrees with the findings of Emadi and Kermanshahi (2006) on the effect of turmeric rhizome powder on the performance of broiler chicks. According to Ahmadi (2010), the inclusion of turmeric powder to a feed contaminated with aflatoxin in birds at the rate of 0.3-0.6g/kg had no effect on feed intake, but significantly increased the final live weight, and a better feed conversion ratio. The pigs feed with diet 4 had the highest final live weight of 12.36 kg followed by diet 3 and 2, animals feed with diet 1 had the lowest final weight of 10.04 kg. Durrani et al (2006) also reported that the supplementation of 5.0g/kg turmeric meals in the diets of broilers resulted in a significant improvement on the body weight gain and feed conversion ratio. The increase in final body weight of animals fed diet 4 could also be attributed to the presence of amino acids and antioxidants in TUP. According to Rajib Chandra Das et al (2014), turmeric powder contains about 27.32mg/100g of vitamin C and amino acid (essential and non-essential) in different proportions. Higher feed cost was incurred by feeding pigs on diet 1 and 2 turmeric powder from their

higher feed consumption.

According to Prasad et al (2008) turmeric contains about 1.08% tannin, which plays a key role in specific interactions with vital proteins such as enzymes in microbial cells (Scalbert, 1991). The heamatological values investigated shows that there was no significant (P>0.05) difference in the PCV, Hb, RBC, MCV, MCH and MCHC, this could be related to nutritional adequacy and safety of TUP in the body of the animals. However, all the values of the parameters measured fall within the normal range established by Coronado (2014) and Etim et al (2013) for swine. Hematological parameters are also good indicators of the physiological status of animals (Khan and Zafar, 2005), they are also used to determine stresses due to nutrition and other factors (Afolabi et al, 2010).

The WBC count and its differentials were not significantly (P>0.05) affected by TUC inclusion, which shows that most of the anti-nutrients in the turmeric powder might have been reduced to a safety margin during processing. According to Nse Abasi N. Etim (2014) when WBC, neutrophils and lymphocytes fall within the normal range, it indicates that the feeding pattern do not affect the immune system. Copland (1976) also reported that a significant higher WBC count of pig is thought to be due to chronic pneumonia and parasitism.

CONCLUSION

The results of the present study reveals that supplementing Turmeric powder (TUP) in the diets of weaner pigs up to 6% led to the improvement in growth performance and reduction in the cost of production.

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