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Research Article

A COMPARATIVE STUDY ON THE EFFECT OF ANTIBIOTIC, PROBIOTIC AND HERBAL RESIDUE ON THE PERFORMANCE OF GROWING CROSS-BRED PIGS

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ABSTRACT
Twenty four growing cross-bred pigs (15.09 ± 0.32kg) were divided at random into 4 groups (T_1–T_4) containing 6 animals each in a CRD model. A basal diet (Control -T_1) was formulated and subsequently T_2, T_3 and T_4 diets were formed by supplementing antibiotic, probiotic and herbal residue, respectively. The digestibility of nutrients and growth performance were studied. Digestibility of nutrients were similar across all the treatments except for DM digestibility which was higher ($P<0.05$) in treatment groups (T2, T3 and T4) than control. T_3 recorded higher ($P<0.05$) ADG (g) with lower ($P<0.05$) feed intake per kg gain and cost of feed per kg gain. The feed per kg gain was less ($P<0.05$) in T3 by 1.18, 1.09 and 1.09 times as compared to T_1, T_2 and T_4, respectively. There was an increase ($P<0.05$) in cost of pork production by (Rs) 11.52, 5.84 and 5.66 per kg for T_1, T_2 and T_4, respectively. It was concluded that supplementation of probiotic to pig feeds significantly improved the growth performance and may not show considerable difference in terms of nutrient digestibility.

Keywords: *Feed Additives, Growth Performance, Nutrient Digestibility*

INTRODUCTION
The diet, micro biota and gastrointestinal tract (GIT) interactions of mammals are extremely complex. A correct balance within the GIT micro biota facilitates efficient digestion and maximum absorption of nutrients, and increases resistance to infectious diseases in pigs. In order to enhance growth and to prevent and treat infectious diseases, antimicrobial compounds have been fed to weaned pigs for several decades. The extensive use of subtherapeutic levels of antibiotics as feed additives has sparked controversy for adverse effects though they were reported to reduce microbial load in GI tract. Public concern over use of antibiotic feed additives has lead to research on alternative substances like herbal residues with antimicrobial properties. It was reported that supplementation of phytogenic feed additives when compared with antibiotics or organic acids had similar effects on the gut in pigs and poultry (Windisch *et al.*, 2008).
A recent study in pigs also showed that *Saccharomyces* supplementation improves post weaning growth performance and modulates the proliferation rate of epithelial cells and the number of macrophages in the ileum (Bontempo *et al.*, 2006). Another mechanism of action for probiotics might involve interaction with micronutrients such as vitamins like thiamine, riboflavin, pantothenic acid and biotin (Branner and Roth-Maier, 2006). Hence, in the present study an attempt is made to make a comparative study by feeding antibiotic, probiotic and herbal residue to growing pigs in terms of nutrient digestibility and growth.

MATERIALS AND METHODS
One basal diet (table 1) was formulated as per NRC (1998) requirements and was evaluated during grower (15-35 kg) phase. The diet was fed to 24 cross-bred (LWY X Desi) grower pigs with an average body weight of 15.09 kg ± 0.32, divided into four groups of animals (T_1-T_4) in block design containing 6 animals in each group. The basal diet was added with 25 g of antibiotic (Tetracycline), 100 g of probiotic (brewers dried Yeast and *Saccharomyces cerevisiae*) and herbal residue (Aswagandha-*Andrographis panniculata*) to form treatments II, III and IV respectively. Treatment I is control without feed additive.
The pigs were housed individually in separate pens both during grower and finisher phases. All the pigs were dewormed before the start of the trial. The pigs had free access to feed and water throughout the

duration of the growth trial. The daily feed offered and the left over was recorded and the body weights of the pigs were recorded at two weeks intervals. One digestion trial was conducted during grower (25 kg live weight) phase using all the six animals in each treatment. The duration of the experiment was for about 65 days.

The pigs were individually placed in metabolic cages and had free access to water. Feed was offered according to the groups. The pigs were acclimatized to the cages for 3 days followed by a collection period of 5 days. During the collection period, faeces were collected daily from each pig. The daily feed intake, left over and faeces voided was recorded. An aliquot of $1/10^{th}$ of the total faeces voided was preserved for further laboratory analysis. The diet and faecal samples were analyzed for proximate composition (AOAC, 1995). Data was subjected to One-way analysis (Snedecor and Cochran, 1994).

Table 1: Ingredient and Chemical Composition (%) of Basal Diet

Ingredient	**(%)**
Maize	40.0
Soybean meal	17.0
Deoiled Rice bran	40.0
Mineral mixture #	2.0
Salt	1.0
TOTAL	**100**
Lysine (%)	0.04
Methionine (%)	0.01
AB_2D_3 (%)	0.02
Biovital (%)	0.02
Cost per 100 Kg (Rs.)	1509
Proximate composition (%) [a]	
DM	89.4
OM	86.8
CP	16.3
TA	13.1
EE	1.9
CF	11.3
NFE	57.1
NDF	36.1
ADF	24.3

 # contained, Ca 32%; P 6%; Mn 0.27%; Zn 0.26%; Cu 100 ppm; Fe 1000 ppm, Iodine 0.01%; Fluorine (max.) 0.03%

[a] *on Dry Matter basis except for DM*

RESULTS AND DISCUSSION

The ingredient and chemical compositions (%) of the basal diet is presented in Table 1. The dry matter digestibility was higher ($P<0.05$) for T_2 to T_4 groups (Table 2) than T1 indicating that feed additives enhance the nutrient utilization and improves digestion.

The digestibility of other nutrients was non-significant. It was reported that the yeast cells contain the cell wall oligosaccharides, peptides and amino acids which may stimulate appetite and improve feed intake (Gao *et al.,* 2008). The yeast protein also contains nucleotides which reportedly stimulated the development of GI tract (Silva *et al.,* 2009). It was hypothesized in the present study and these effects would increase the nutrient uptake from the small intestines contributing more growth rate in probiotic and other feed additive supplemented groups. Feeding antibiotic lead to an increased digestibility of certain nutrients (Manzanilla *et al.,* 2006) probably for the reason that antibiotics spare nutrients for the host restricting their uptake by bacteria (Fairbrother *et al.,* 2005). On average, feeding antibiotics, an

improvement in feed efficiency of 2–3% has been reported while average daily gain was improved by 25 g (Kjeldsen, 1999).

Table: 2 Effect of Dietary Treatments on Nutrient Digestibility and Performance of Cross-Bred Pigs

Parameter	T1	T2	T3	T4
DM *	78.10 ^{a} ± 0.78	82.20 ^{b} ± 1.44	84.78 ± 1.84	82.10 ^{b} ± 0.86
OM	81.30 ± 1,77	80.70 ± 1.11	83.30 ± 1.54	80.40 ± 2.09
CP	73.20 ± 1.17	76.10 ± 2.10	77.40 ± 0.81	76.30 ± 1.07
CF	34.40 ± 1.34	33.60 ± 1.63	35.30 ± 1.12	32.10 ± 1.75
EE	54.70 ± 1.86	55.18 ± 0.97	54.31 ± 1.22	55.70 ± 1.15
NFE	80,.33 ± 1.54	82.50 ± 1.23	85.60 ± 1.57	84.50 ± 2.33
NDF	35.10 ± 1.30	33.45 ± 1.27	34.60 ± 1.16	34.25 ± 0.66
ADF	22.74 ± 1.07	24.44 ± 1.12	25.16 ± 0.85	23.31 ± 0.56
Growth Performance				
Initial wt.(kg)	15.16 ± 0.18	15.08 ± 0.30	15.06 ± 0.33	15.08 ± 0.26
Final wt.(kg)*	35.12 ^{ab} ± 0.23	34.98 ^{ab} ± 0.21	35.51 ^{b} ± 0.31	34.71 ^{a} ± 0.16
Weight gain (kg)	19.93 ± 0.33	19.90 ± 0.40	20.45 ± 0.40	19.63 ± 0.40
No. of days*	62.16 ^{b} ± 1.16	57.50 ^{a} ± 1.56	55.16 ^{a} ± 1.16	58.66 ^{ab} ± 1.47
ADG (g)*	320.66 ^{a} ± 5.48	347.16 ^{ab} ±11.71	371.33^{b} ±11.03	335.50 ^{a} ±8.60
ADFI(kg)*	1.58 ^{b} ± 0.19	1.57 ^{ab} ± 0.17	1.54 ^{ab} ± 0.16	1.55 ^{a} ± 0.19
FCR*	4.92 ^{b} ± 0.12	4.55 ^{ab} ± 0.17	4.16 ^{a} ± 0.15	4.54 ^{ab} ± 0.78
Cost of feed/kg gain (Rs)*	74.36 ^{b} ±1.84	68.68 ^{ab} ±2.58	62.84 ^{a} ± 2.35	68.50 ^{ab} ±1.18

^{ab} *values in a row not sharing common superscripts differ significantly * (P<0.05)*

Animals fed with *Saccharomyces cerevisiae* showed higher (P<0.05) average daily gain (g) than others. It was reported that that the yeast cells contain the cell wall oligosaccharides, peptides and amino acids which may stimulate appetite and improve feed intake (Gao *et al.*, 2008). It was reported that the nucleotides present in yeast protein reportedly stimulated the development of GI tract (Silva *et al.*, 2009). It was hypothesized in the present study that these effects would increase the nutrient uptake from the small intestines contributing more growth rate in probiotic fed group.

Significant differences (P<0.05) were also noticed with feed per kg gain and cost per kg gain for the herbal residue supplemented group. The group having herbal residue was able to improve the performance than the control which was due to inhibition of pathogenic bacteria in the gut (Suryanarayana *et al.*, 2010). The feed per kg gain was less (P<0.05) in T_3 by 1.18, 1.09 and 1.09 times as compared to T_1, T_2 and T_4, respectively. There was an increase (P<0.05) in cost of kg pork production by (Rs) 11.52, 5.84 and 5.66 for T_1,T_2 and T_4, respectively as compared to probiotic fed (T_3) group.

Conclusion

It was concluded that feed supplementation of antibiotics, probiotics and herbal residue improve the performance of pigs significantly and may not show considerable difference in terms of nutrient digestibility.

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