Research Article

Effect of Pre-Biotic and Pro-Biotic Dietary Supplementation in Growing Pigs

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Abstract

Twenty eight crossbred LWY growing pigs weighing 20±0.5 kg were divided into 4 groups to study the effect of Pre-biotic (Fructo-oligosaccharides) and Pro-biotic (Scchyromyces cerevisiae, a dry yeast) on nutrient utilization, performance and faecal bacterial populations. Group one (T1) is the control without any feed additive, T2 is the T1+ 2% Pre-biotic, T3 is the T1+ 0.2% Pro-biotic and T4 is the T1 with 2% Pre-biotic and 0.2% Pro-biotic. Organic matter, crude fibre, crude protein digestibility values and average daily gain were higher (P<0.05) for T4. Total number of days taken to reach the target weight (40 kg) and feed conversion ratio were less (P<0.05) for T4. Total count, Coliforms, Salmonella and Staphylococcus bacteria was decreased with a corresponding increase (P<0.05) in Lactobacillus counts in T4 followed by T3, T2 and T1 (control). It was concluded that Pre-biotic in combination with pro-biotic supplement provide better in terms of performance, growth rate and decreases the pathogenic bacteria.

Keywords: Pre-biotic, Pro-biotic, pigs, growth performance, nutrient utilization, faecal microflora

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Introduction

Now a days the use of antibiotics as growth promoters were banned due to development of bacterial antibiotic resistance. In addition, misusing antibiotics as feed additives for pig production can result in high antibiotic residues in pork. Developing new feeding strategies like pre and pro-biotics are particularly important in reducing post weaning digestive disorders. In pig production, pro-biotics, which are live cultures of harmless bacteria or yeast species that equilibrate intestinal microflora, maintaining the intestinal ecosystem, improving animal health, improving growth rate, feed efficiency, barrier properties of the intestinal wall, immunity and nutrient digestibility by increasing the gastrointestinal population of beneficial bacteria. Pre-biotics like Fruto-oligosaccharides (FOS) are water soluble carbohydrates which can be classified as non-digestible oligosaccharides and cannot be hydrolyzed by the enzymes of endogenous origin (Oku *et al.*, [1]. As a consequence these are available as a substrate for the gastro-intestinal microflora. Several authors reported increased growth and feed conversion efficiency together with reduced incidence of diarrhoea on feeding FOS in young pigs. Hence the present research was designed to investigate the effect of feeding FOS and pro-biotic on the growth performance of growing crossbred pigs.

Materials and Methods

The basal diet formulated (NRC, [2] was fed to 28 male pigs (75% LWY X 25%desi) with an average body weight of 20±0.5 Kg, divided into four groups at random. All the pigs were dewormed before the start of the grower phase (20-40 kg) and housed individually in separate pens. Feed was offered according to the groups. The daily feed offered, the left over feed, faeces voided were recorded and the body weights of the pigs were recorded at weekly intervals. Fresh faecal samples of 1-2g were taken at every fort-nightly intervals from the rectum under sterile conditions for bacteriological enumeration. One digestion trial was conducted after the animals attained a body weight of about 30 kg using all the 7 animals in each treatment. The diet and faecal samples were analyzed for proximate composition (AOAC, [3]. The data thus obtained was subjected to statistical analysis using SPSS MAC, version 20.0, SPSS Chicago (US).

Results and Discussion

Digestibility Coefficient

T_4 significantly recorded higher (P<0.05) organic matter (OM), CP digestibility and Crude fiber (CF) values which might be due to feed additives enhance the nutrient utilization and improves digestion. Addition of Pre-biotic to T_4 would have increased the pro-biotic organisms contributing for more OM, CF and CP digestibility. The oligosaccharides, peptides and amino acids present in the yeast cells will stimulate appetite and improve feed intake (Gao *et al*., [4]. These results were similar to Giang *et al*., [5] and Suryanarayana *et al.,* [6].

Growth performance

T_4 significantly (P<0.05) recorded lower feed conversion ratio (*FCR = Feed intake / Weight gain*) and higher average daily gain (ADG). Total number of days taken to reach the target weight (40 kg) was less (P<0.05) for T_4 but no significance was observed for total weight gain and average daily feed intake which could be due to an increased (P<0.05) total tract apparent digestibility of major nutrients (CP and OM) for T_4 and this could have been contributed for increased average daily gain [7, 8]. Gao *et al.,* [4] reported that the oligosaccharides, peptides and amino acids present in the yeast cells will stimulate appetite and improve feed intake. The yeast protein also contains nucleotides which reportedly stimulated the development of GI tract (Silva *et al*., [9]. These results are in agreement with Giang [10], Wilcock [11], Giang *et al*.,[5], Suryanarayana *et al.*,[6],Vandana *et al*., [12], Mishra *et al.*,[13] and Trevisi *et al.,* [14].

Table 1 Effect of dietary treatments on the digestibility coefficients of nutrients

	T_1	T_2	T_3	T_4
Dry matter	79.1 ± 0.82	80.3 ± 1.19	80.5 ± 2.11	80.7 ± 0.98
Organic matter *	74.3 ± 1.05^{d}	78.1 ± 2.61^{c}	81.0 ± 2.12^{b}	84.7 ± 2.01^{a}
Crude protein *	75.0 ± 0.21^{c}	76.1 ± 1.51^{c}	79.9 ± 2.01^{b}	83.1 ± 0.52^{a}
Crude fibre*	33.6 ± 2.01^{a}	40.6 ± 1.09^{c}	35.2 ± 0.63^{b}	43.8 ± 4.21^{d}
Ether extract	73.2 ± 2.06	74.5 ± 3.61	75.4 ± 2.04	76.3 ± 2.29

(P<0.05); Means bearing at least one common superscript in the same row and in the same column do not differ significantly.

Table 2 Effect of dietary treatments on the Growth performance

	T_1	T_2	T_3	T_4
Initial wt.	20.6±0.35	20.5±1.42	20.3±1.15	20.0±1.26
Final wt.	40.0±1.46	40.2±0.62	40.3±1.15	40.6±0.05
Total Wt.	19.4±0.49	19.7±1.52	20.0±1.57	20.6±0.21
No. of days *	87.0 ± 3.52^{a}	82.5 ± 3.42^{b}	77.5 ± 2.45^{c}	70.0 ± 1.36^{d}
ADG*	222.9 ± 2.11^{a}	238.7 ± 6.22^{b}	258.1 ± 5.35^{c}	294.2 ± 4.54^{d}
FCR *	4.48 ± 0.57^{c}	4.16 ± 0.46^{bc}	3.85 ± 0.11^{b}	3.33 ± 0.31^{a}
Avg. daily feed intake(g)	1000.2±52.61	995.1±37.52	996.0±61.24	980.0±64.42

(P<0.05); Means bearing at least one common superscript in the same row and in the same column do not differ significantly.

Table 3 Effect of dietary treatments on the average faecal bacterial population

	T_1	T_2	T_3	T_4
Lactobacilli *	160.6±37.34[a]	301.2±67.02[b]	404.8±28.46[c]	590.8±91.17[d]
Total Count *	812.2±20.45[c]	510.5±43.03[b]	451.9±52.91[b]	251.5±64.80[a]
Salmonella *	773.6±56.49[d]	671.3±30.12[c]	556.0±73.17[b]	312.5±46.17[a]
Coliforms *	901.0±54.43[c]	638.1±65.41[b]	635.5±50.75[b]	229.3±20.17[a]
Staphylococcus *	61.6±1.65[c]	49.8±2.92[b]	47.1±6.78[b]	17.2±6.93[a]

(P<0.05):Means bearing at least one common superscript in the same row and in the same column do not differ significantly.
T_1: Control without any feed additive; T_2: T_1+ 2% fructo-oligosaccharides (FOS); T_3: T_1+ 0.2% Pro-biotic; T_4 :T_1 with 2% FOS and 0.2% Pro-biotic.

Faecal bacteria

Significantly (P<0.05) higher *Lactobacillus* count and Lower (P<0.05) total counts, Coliform, Staphylococcal and Salmonella counts were noticed in T_4 which might be due to synergistic effect of a pre-biotic and pro-biotic would have increased *Lactobacillus* count and decreased the other pathogenic counts in T_4. These results were in accordance with Li *et al*., [8], Giang [10], Giang *et al*., [5], Suryanarayana *et al.*,[6] and Mishra *et al.,* [13].

Conclusion:

It was concluded that combined administration of pro-biotic (*Saccharomyces cerevisiae*) and pre-biotic (FOS) enhanced growth rate, nutrient digestibility and gut health by promoting the growth of *Lactobacilli* and diminishing the growth of potentially harmful pathogens.

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