EFFECT OF DIETARY SUPPLEMENTATION WITH FERMENTED SOYBEAN MEAL ON GROWTH PERFORMANCE, LIPIDS METABOLISM AND IMMUNITY OF TLRI BLACK PIG NO. 1.

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ABSTRACT

The aim of this study was to investigate the effects of feeding probiotics on growth performance, nutrients digestibility, lipids metabolism and immunity in growing-finishing TLRI black pig No. 1. Total of 48 pigs weighing 32 kg were randomly allotted into three treatments. There were two pigs per replicate(pen) and eight replicates per treatment. Control group was fed with basal diet, probiotics A which contained basal diet＋probiotics(soybean meal inoculated with *Streptococcus thermophilus*, *Lactobacillus acidophilus*, *Aspergillus awamori*, *Bifidobacterium thermophilum*, *Saccharomyces cerevisiae*, *Corynebacterium acetoglutamicum*, *Bacillus licheniformis*, *Aspergillus oryzae)* and probiotics B which contained basal diet＋probiotics (soybean meal inoculated with *Streptococcus thermophilus*, *Lactobacillus acidophilus Aspergillus awamori*, *Bifidobacterium thermophilum*, *Saccharomyces cerevisiae*, *Aspergillus niger*, *Trichoderma koningi)*. The results demonstrated that the probiotics B group had significantly improved the FE (feed/gain) and phosphorous utilization than others group ($P < 0.05$), and was significantly higher than control group in digestibility of GE and CP ($P < 0.05$). Furthermore, the probiotics A group had a greater crude fiber digestibility than other groups ($P < 0.05$). Diet contained probiotics could decrease the amount of *E. coli*. in feces ($P < 0.05$). In serum lipids levels, probiotics A group had the lowest cholesterol concentration, and had lower LDL-C concentration compared with control group ($P < 0.05$). In immune responses, after HC vaccine injection, the HC specific antibody titer increased significantly in the second week for pigs fed with probiotics B diet. In conclusion, the results indicated that probiotics supplementation had beneficial effect on growing-finishing pigs. Nevertheless, the results showed that these effects will be variable if supplemented with different probiotics assortment.

KEY WORDS: Probiotics, Growth performance, Nutrients digestibility, Lipids metabolism, Immune response.

INTRODUCTION

As raising pig has become more industrialized with intensive commercial units. Nonetheless, it would lead to the problems of growth performance and gastrointestinal health. Medical products such as antibiotics have been used very successfully to protect against diarrhea and promot growth performance(Walton, 1980). However, there is an increasing

concern from both consumers and authorities about the health risks involved in consuming meat containing residues from feed additives as well as the potential hazards from spreading of resistance factors by indiscriminate use of antibiotics. Probiotics may be an alternative in place of antibiotics to be used exclusively as a growth stimulant and for improvement in feed conversion rate in farm animals. Probiotics are defined by Fuller（1989）as a live microbial feed supplement which beneficially affects the host animal by improving its intestinal microbial balance. Using multi–strain microbe has been justified by the claim that it is acting on a broad spectrum and was expected to be active in several different species of host animal (Fuller, 1989). The purpose of this research is to study the effects of probiotics on growth performance, nutrient digestibility, lipids metabolism and fecal microflora in growing-finishing pigs.

MATERIALS AND METHODS

Experimental Design

A total of 48 TLRI black pigs with an initial body weight of 32 kg, were randomly allotted into three treatments. There were two pigs per replicate (pen) and eight replicates per treatment. Water and food were supplied *ad libitum.* The diet was formulated to meet the nutrient requirement of pig according to the National Research Council(1998). Pigs were weighed every two weeks and injected HC vaccine as antigen for immune response assay at weight 90 kg. Nutrients digestibility experiment was two replicate trials with 12 black pigs. The pigs were housed in individual stainless steel cages. In experiment period, feed were added 0.6 % Cr_2O_3 as an inert indicator in order to determine crude protein, crude fiber, energy and phosphorus retentions.

Determination and analysis

Fecal and feed samples form each replicate were ground separately in mill before determined. Nutrients determined was according to AOAC(1980). For microbiological analysis, intestinal content samples were serially diluted and plated in count agar according to Bacteriological Analytical Manual for Foods (FDA, 1996). The microflora enumerations were expressed as $\log_{10}$ colony forming units（CFU）per gram. Blood immunoglobulin were quantified utilizing a commercial ELISA kit (BETHYL Laboratories INC. USA) and determined by ELISA reader (Thermo Labsystems, Finland).

Statistical analysis

General Linear Model Procedure was used to analyze the data. Duncan multiple range tests were used to test significantly different between treatment means. The statistical analysis were using SAS program(1999). Differences were considered to be significant at $P < 0.05$.

RESULT AND DISSCUSSION

Both ADG and FE were significantly increased in Probiotics B. This is agreement with other researchers who reported probiotics to have positive effect on the growth of growing-finishing pigs (Shon *et al*., 2004). Nonetheless, results were variable in our experiment. Probiotics A had no significant different compared with control. Some studies have been reported that fed probiotics has no benefit in growth performance (Heugten *et al*.,

2003). As Shon *et al*.(2004) reported, fed microbe have shown their greatest potential in very young and rapidly growing pigs. The effect on growing-finishing pigs were fewer or even negative response. In our study, growth performance were significantly different between two probiotics composition group. The effects may be different when fed different probiotics composition or species.

In nutrients digestibility, dietary supplement with probiotics resulted in increased digestibility of CP, CF, GE and P. Digestibility measurement were made at the fecal level; therefore, calculations include disappearance of nutrients through absorption and bacterial assimilation of nutrients in the small and large intestine. Nonetheless, the response was variable in supplementation of different probiotics composition. It could be caused by different bacteria extra cell enzymes.

Dietary supplement with probiotics can potentially alter gut microflora by selectively stimulating growth of beneficial bacteria while suppressing the growth of pathogenic bacteria (Heugten, *et al*., 2003). In microbial analysis, *E. coli* was decreased significantly by feeding probiotics. Shu *et al.* (2002) reported that fed *L. rhammnosus* could increase mice intestinal anti-*E. coli* IgA responses and blood leucocyte phagocytic activity, and reduce the severity of *E. coli* infection.

Serum cholesterol was significantly decreased by feeding probiotics. Many researchers have shown similar effect of administration of *L. acidophilus* on the serum cholesterol levels in pig (Rodas *et al*., 1996). The mechanism of probiotics to reduce cholesterol level was not clearly understood. However, in our study, two probiotics groups had different effect, which was probably because microbial interaction altered fermented soybean meals microbial population. However, in our previous study, the total bacteria and lactic acid bacteria were not different between two probiotics formulas. There is room for further investigation. In immune response, after injected with HC vaccine as antigen, the serum HC specific antibody titer was increased when diet was supplemented with probiotics. Lõpez (2000) pointed out that probiotics could stimulate the immune system and increase the concentration of IgG.

CONCLUSION

Evaluation of the effectiveness of using probiotics in animal feed becomes critical with the increased concern about antibiotic use in swine diet. The present study suggested that administration of probiotics could improve pig growth performance, reduce the incidence of diarrhea caused by enterotoxigenic strains of *E. Coli* in weaned piglets. This study demonstrated that complex probiotics has positive effect on growth performance, nutrients utilization, and balances the gastrointestinal microflora. However, these effects were variable in supplementation with different probiotics combination.

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