Performance of Broilers and Pigs Supplemented with ProEn-K®

MARIA TERESA SJ. VALDEZ *[1], MARLIZA D. VILORIA[1], YANCY O. WAMINAL[1], and HAZEL J. CARIÑO[1]

[1] *College of Agriculture and Forestry, Tarlac Agricultural University, Camiling, Tarlac*

Abstract

This research was undertaken to evaluate the growth performance of growing-finishing pigs and broilers fed with rations containing ProEn-K® ; and to determine the cost efficiency of using it in broiler and hog production.

Results 10% incorporation of ProEn-K® in broiler ration resulted in broiler performance (gain in weight, feed intake, feed conversion ratio) comparable to the broiler performance resulting from the use of pure commercial broiler rations. Moreover, 10% incorporation of ProEn-K® in growing-finishing hog ration resulted in better pig performance (gain in weight, feed conversion ratio) than the use of pure commercial hog ration. Average daily gain was higher (625.94 g vs. 604.17 g) among pigs fed with ProEn-K® than those fed with pure commercial ration. Results further showed that the use of ration with ProEn-K® proved more cost efficient (8.90% vs. 3.32% return on investment) than the use of pure commercial hog ration.

Keywords: fermentation product, protein-enriched sweetpotato, solid state bio-processing

Introduction

Chicken and pork are the most popularly consumed commodities in the local market because both commercial and small-hold broiler and hog production contribute to meat availability. To sustain this, ways and means are continuously being employed in order to lessen feed costs while at the same time sufficiently supplying the necessary nutrients to ensure fast growth and development of pigs and chickens.

The use of alternative non-conventional feed materials which has been proven to be cheaper and of good nutritional value is one strategy that can be employed to sustain a more cost efficient production of meat for the increasing demand of the Philippine population. The Tarlac College of Agriculture (thru its researchers, R.A. Demo-os, M.T. SJ. Valdez, and M.C. Mapili Jr.) developed in 1999 to 2000 a feed resource for livestock, poultry, and aquaculture species. The feed resource, originally called *protein-enriched sweetpotato* (PESP), was developed from sweetpotato which was subjected to a fermentation protocol. Although sweetpotato is a good energy source due to its carbonaceous nature, it is of inferior nutritive value as feed. It has low percentage of protein, ash and mineral matter. However, the use of microorganisms to convert carbohydrates and cellulose into feedstuff rich in protein is possible through fermentation. Through this process, the erstwhile low-value crop for animal feed takes on an inexpensive, high-value form, which if widely utilized can significantly reduce production cost. Demo-os et al. (2000) reported the analysis of fermented sweet potato which showed a substantial increase in crude protein content at 30.8% as compared to 1.60% in its natural form. This was brought about by the conversion of carbohydrate substances into amino acids and eventually to microbial proteins through the microorganisms own growth and metabolic activities. Many feeding trials conducted in early to mid-2000 established the optimum amounts of PESP incorporation in regular hog, broiler, tilapia, bangus, and crustacean rations.

In 2011, in cooperation with DA-BAR, TCA was able to register the fermented feed product with IPO-Phil carrying the trademark ProEn-K®. Having started its commercialization since the grant of the trademark, showcases have been established on-farm involving aquaculture cooperators from Dagupan, Bataan, Zambales, and Bulacan. To continue its promotion, the study aimed to showcase the ProEn-K®technology in the Pig-

* Corresponding author. *email:* valdez_tess59@yahoo.com;

gery Project of the Tarlac College of Agriculture and in the DOLE-assisted Broiler Production Enterprise operated by the League of Animal Science Students of the Tarlac College of Agriculture as an initial step of promoting it to target users.

Specifically, it was conducted to evaluate the performance of broilers and growing-finishing pigs fed with rations containing ProEn-K®and to determine the cost efficiency of using it in hog and broiler diet.

Methodology

Feeding Trial with Hogs

Twelve pigs were used in the feeding trial. The pigs were distributed in two treatment lots with six pigs per treatment. The experimental treatments were: *pure commercial ration (Control)*, and *90% commercial ration + 10% ProEn-K®* .

Experimental pens were disinfected prior to the trial. The experimental rations were given to pigs starting at 45 days of age. Restricted feeding was employed, and experimental rations were given twice a day (morning and afternoon). The feeding trial lasted for 96 days.

Feeding Trial with Broilers

Two hundred straight-run broiler chicks were used in two feeding trials. Each feeding trial made use of 100 heads. The chicks were distributed in two treatment lots, each was replicated five times with 10 chicks per replicate. The experimental treatments were: *pure commercial rations (Control)*, and *90% commercial broiler rations + 10% ProEn-K®* .

Experimental cages were disinfected prior to the trials. The experimental rations were given to the chicks starting at 15 days of age (after brooding). *Ad libitum* feeding was employed, and experimental rations were made available at all times to allow full feeding among the experimental birds. Each feeding trial lasted for 35 days.

Evaluation of Performance and Data Analysis

The performance of pigs during the growing-finishing stage was evaluated in terms of gain in weight, average daily gain (ADG), and feed conversion ratio (FCR). Broiler performance was evaluated in terms of gain in weight, feed intake, and feed conversion ratio (FCR). Cost efficiency was evaluated using feed cost per kilogram gain in weight, and percentage return on investment (ROI). The data were subjected to statistical analysis using t-test (Shapiro-Wilk method).

Results and Discussion

Performance of Pigs

The growth parameters used to evaluate the performance of growing-finishing hogs given diet with or without ProEn-K® are presented in Table 1. Analysis of data taken from experimental pigs in the treatment lots revealed non-significant differences by t-test in terms of final weight. However, gain in weight and ADG are significantly heavier in pigs on rations with ProEn-K®. Likewise, FCR was significantly better indicating that pigs required lesser amount of feeds to produce a unit gain in weight, indicating marked improvement in feed efficiency. Demo-os et al. (2000) also found that the optimum percentage of incorporation of ProEn-K® in swine ration is 10%. At this incorporation rate, significant improvement in gain in weight, ADG, and FCR were obtained. It should be noted that the differences in ADG and FCR would significantly matter when the value is factored into the calculation of cost efficiency. On fermentation, the crude protein content of sweet potato increased 17-folds (Demo-os et al., 2000). Similarly, Abu et al. (1999) reported significant increase in protein and lipid contents of fermented sweet potato above the unfermented samples. The nutrient enrichment is brought about by an increase in biomass yield and protein content after fermentation using selected fungi (Gélinas and Barrette, 2007; Correa et al., 2007).

Performance of Broilers

The performance parameters used to evaluate the performance of broilers given ration with or without ProEn-K® are presented in Table 2. Analysis of data taken from experimental birds in the treatment lots revealed non-significant dif-

Table 1. Comparative performance of growing-finishing pigs fed experimental ration with or without ProEn-K®

Performance Parameter	Pure Commercial Ration	90% Commercial Ration + 10% ProEn-K®	t-value	Prob. Value
Initial Weight, kg	24	24.5	-0.6847ns	0.524
Final Weight, kg	82	84.67	2.2700 ns	0.0723
Gain in Weight, kg	58	60.06	3.6900 *	0.0141
Average Daily Gain, g	604.17	625.94	3.6900 *	0.0141
Feed Conversion Ratio	3.53	3.4	-2.5800*	0.0496

ns – not significant; * – significant

ferences by t-test. The comparable growth performance is a confirmation of the findings of Demo-os et al. (2000) that the optimum percentage incorporation of ProEn-K® in broiler ration is 10%. At this incorporation rate, gain in weight, feed intake, and FCR among broilers are similar to those fed with pure commercial ration. Further, the verification study conducted by Balgos (2013) confirmed that ProEn-K® at inclusion rates higher than 10% (20%, 30%,40%), led to significant reduction in broilers gain in in weight, marked depression in feed intake, and significantly less efficient feed conversion. The comparability of rations without and with 10% ProEn-K is due to the maintenance of protein and energy status of the diet because fermentation increased the protein content of sweet potato (Demo-os et al., 2000; Yang, 2004). This increase approximates that of the standard broiler ration (19-21% CP), thus the nutrient density remained suitable to the growth and development of broilers.

Cost Efficiency

Table 3 presents the comparison of using the two experimental rations for hogs. The control ration (pure commercial) cost ₱23.00 per kilogram, however, when commercial ration and ProEn-K® were combined at a ratio of 9:1, the mixture cost was reduced to ₱21.96. This is because ProEn-K® is a lot cheaper than the commercial hog ration. Calculating the feed cost per kilogram weight produced (cost of feed per kg x FCR) consequently revealed a savings of ₱6.53 for every kilogram of weight added by a hog during the growing-finishing stage. Finally, the percentage return on investment was markedly higher (8.90% vs. 3.32%) when ProEn-K® was included in the hog diet (Table 3).

In terms of cost efficiency, Table 4 showed that inclusion of 10% ProEn-K® reduced the cost of ration by ₱1.67, and gave a savings of ₱0.43 on feed cost to produce a kilogram broiler. Percentage return on investment was comparable with the use of the two rations.

Conclusions

Growing-finishing hog ration containing 10% ProEn-K® results to heavier weight gain, better ADG, and better FCR compared to the pure commercial hog ration. Broiler rations (starter and finisher) containing 10% ProEn-K® result to comparable gain in weight, feed intake, and FCR as the pure commercial broiler ration. The use of growing-finishing hog ration containing 10% ProEn-K® is more cost efficient than the use of pure commercial hog ration. The use of broiler ration containing 10% ProEn-K® is as cost efficient as the use of pure commercial broiler ration.

The research confirms that ProEn-K® may now be used as basic component of hog and broiler rations, be it commercial or custom-mixed. In support of its commercialization, ProEn-K®'s use for broilers, hogs, and aquaculture species by cooperating producers have to be sustained, and efforts to promote it intensively to other potential users should be initiated.

Table 2. Comparative performance of broilers fed experimental ration with or without ProEn-K®

Performance Parameter	Pure Commercial Broiler Ration	90% Commercial Ration + 10% ProEn-K®	t-value	Prob. Value
Final Weight, kg	1.73	1.69	-0.4986 ns	0.664
Gain in Weight, kg	1.3	1.26	0.9655 ns	0.8455
Feed intake, kg	2.66	2.71	1.0500 ns	0.3531
Feed Conversion Ratio	2.06	2.17	1.1200 ns	0.3243

ns – not significant

Table 3. Comparative cost efficiency of using the experimental ration with or without ProEn-K®

Cost Efficiency Parameter	Pure Commercial Ration	90% Commercial Ration + 10% ProEn-K	Difference
Cost of feed per kg, ₱	23	21.96	1.04
Feed cost per kg/weight produced, ₱	81.19	74.66	6.53
% Return on Investment	3.32	8.9	5.58

Table 4. Comparative cost efficiency of using the experimental ration with or without ProEn-K®

Cost Efficiency Parameter	Pure Commercial Ration	90% Commercial Ration + 10% ProEn-K	Difference
Cost of feed per kg, ₱	29	27.33	1.67
Feed cost per kg/weight produced, ₱	59.74	59.31	0.43
% Return on Investment	39.99	40.13	0.14

References

Balgos, E. (2013). Nutrient evaluation of proenk-based broiler rations. Master's thesis, Tarlac College of Agriculture, Camiling, Tarlac, Philippines.

Correa, R., Magalhaes, M., and Macedo, G. (2007). Protein enrichment of pineapple waste with saccharomyces cerevisiae by solid state bioprocessing. *Journal of Scientific Industrial Research*, 66(3).

DA-BAR (2002). Protein-enriched animal feeds from sweetpotato waste. Online news article (www.bar.gov.ph), Republic of the Philippines, Department of Agriculture, Bureau of Agricultural Research.

DA-BAR (2014). Da pushes sweetpotato as protein-rich aquaculture feed. Online news article (www.bar.gov.ph), Republic of the Philippines, Department of Agriculture, Bureau of Agricultural Research.

Demo-os, R., Valdez, M. S., and Mapili Jr., M. C. (2000). Feeding value of protein-enriched sweetpotato pulp for broilers. *Philippine Journal of Veterinary and Animal Sciences*, 26(1):41–50.

Gélinas, P. and Barrette, J. (2007). Protein enrichment of potato processing waste through yeast fermentation. *Bioresource Technology*, 98(5):1138–1143.

Yang, S. (2004). Protein enrichment of sweet potato residue with amylolytic yeasts by solid-state fermentation. *Biotechnology and Bioengineering*, 32(7):886–890.