

USE OF MILK BY-PRODUCT AS ADDITIVE IN DIET OF WEANER PIGS

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ABSTRACT

The study assessed effect of solid milk waste (SMW) on the performance of weaner pigs. A basal diet that met the nutrient requirements of weaner pigs was formulated, which served as the control diet (Diet 1). Solid milk waste was added to the basal diet at 0.5 and 1 % to make diets 2 and 3 respectively. Fifty-four (54) weaned pigs (Largewhite × Landrace), average 11.8 ± 1.21 kg body weight (BW), were apportioned to three treatments by BW in three replications with 6 pigs per pen in a completely randomized design. Pigs were fed each treatment diet throughout the experimental period using concrete drinker and semi-automatic feeders. Feeds and water were supplied ad libitum. Weekly feed intake and body weight gain were obtained and feed conversion ratio was calculated. The experimental period was 28 days. The performance indices had no significant ($p > 0.05$) difference among dietary treatments. There was no treatment effect on daily weight gain, daily feed intake and feed conversion ratio. However, pig fed diet with 1% SMW had improved daily weight gain (0.423 kg), better feed conversion ratio (2.64) and higher daily feed intake (1.114 kg). It was therefore concluded that addition of solid milk waste in the diets of weaner pigs had no deleterious effect on the performance of the animals.

Keywords: Milk by-product, milk composition, weaner pigs, performance

INTRODUCTION

The use of more digestible protein from animal source is preferred to those from plant origin in starter diets. This has been shown to improve gut health and result in improved growth performance. Protein from animal sources such as milk powder in piglet diets have been reported to be beneficial for intestinal development and health, especially after weaning (Le Huërou-Luron *et al.*, 2018).

According to Wellock *et al.* (2006), pigs offered diets based on dried skimmed milk powder had higher feed intake, greater rates of gain and improved feed conversion ratio than those offered soya based diets.

Many studies have also shown that the use of protein from animal sources such as milk powder in piglet diets prevented behavioral disorders (manipulative, agonistic and abnormal behavior) and led to better performance (Araújo *et al.*, 2010; Bouzerzour *et al.*, 2012; Pluske *et al.*, 2018).

Milk and animal-based products are included in early nursery pig diets to help weaned pigs transition from a milk-based liquid diet to a plant-based solid diet. Previous research has demonstrated that increasing the levels of lactose (milk by-product) in nursery pig diets using dried whey resulted in an improvement in pig performance (Mahan *et al.*, 2004).

Milk powder has been reported to have a good amino acid profile and high digestibility. Its ability to improve the acceptance of the diet and promote the development of the digestive tract makes it an optimal feed component for piglets (Le Huërou-Luron *et al.*, 2018). Supplementation of animal feed with the suitable feed additive is controlled with its economic benefits. Therefore, the use of industrial by-products which were usually discarded is an advantage (Juan *et al.*, 2016). At present, a relatively large proportion of the produced powder milk is discarded which may have a negative environmental effect. There is a need for their alternative use in order to address the environmental issues. Therefore, it was hypothesized that use of solid milk waste as feed additive in weaner's diets could improve growth performance of the animals.

MATERIALS AND METHODS

Experimental location, diets, animals, design and management

The experiment was carried out at AK Research Farms, Eleyele, Ibadan and lasted for 28 days. A basal diet that met nutrient requirement for weaner pig (NRC, 2012) was prepared using common feed components (soybean meal, maize, palm kernel cake, wheat bran, maize bran and fishmeal). Different levels (0.5 and 1%) of solid milk waste (SMW) were added to this basal diet, representing three different dietary treatments: diet 1 as a purely vegetable ration without any other high-quality protein sources. In the diet 2, the use of 0.5% solid milk waste was added to the basal diet while diet 3 contained 1% solid milk waste (Table 1). Fifty-four (54) weaner pigs of average weight of 11.8 ± 1.21 kg were randomly apportioned to the three dietary treatments with each treatment having eighteen (18) pigs and three replicates with six (6) pigs per replicate. The animals were randomized to the experimental treatments using completely randomized design. The feeders were refilled twice daily (morning and evening) to provide *ad libitum* feed supply. Feed leftovers were weighed at the end of every week to determine the weekly feed consumption on pen basis and thus the average daily feed intake per day and animal.

RESULTS AND DISCUSSION

The performance indices of the weaner pigs fed with the experimental diets are presented in Table 2 below. The weaner pigs were uniformly distributed at the onset of the experiment. This was evident by insignificant probability value ($p=0.9075$) of their initial weights across the treatments. The final body weight of the pigs across the treatments were similar and not statistically different ($p>0.05$) from one another. The highest but non-significant value (24.156 kg) was observed in pig fed with 0.5 % solid milk waste (SMW) while the lowest final body weight (20.933 kg) was noticed in pig placed on control diet ($T_1=0\%$ SMW). At 0.5% inclusion of SMW, the pig had improved body weight gain and feed conversion ratio compared with those fed with diets that contained 0 and 1% SMW. There was about 12.4% increment in the final body weight of the pig placed on diet contained 0.5% SMW when compared with others. Negligible difference was observed between pig fed diet without SMW and those on diet with 1% SMW. The body weight gains of the pigs across the treatments were not significantly ($p>0.05$) different and followed similar pattern with their final body weights. The pig on diet with 1% SMW had 16.8 and 22.9% improvement in body weight gain when compared with those fed with 0 and 1% SWM respectively. Again, the daily weight gains were comparable and the highest (0.432 kg) was observed in pigs placed on diets with 0.5% SWM while the lowest daily weight gain (0.326 kg) was noticed in pigs fed diet with highest SMW inclusion level (1%). The daily feed intakes were not significantly different from one another across the treatment with the value ranged from 0.911 to 1.114 kg with the highest and lowest obtained in pigs placed on diets with 0.5 and 1% SWM respectively. Among the feed conversion ratios (FCR), the difference was negligible ($p>0.05$) with best FCR (2.638) found in pigs fed diet with 0.5% SMW and the worst (2.791) was observed in pigs placed on diet without SMW supplementation.

Most diets have been found to be inadequate according to organic production standards or ecological targets (Quander-Stoll *et al.*, 2020). The use of animal-sourced proteins such as milk powder in piglet diets has been reported to prevent behavioral disorders such as manipulative, antagonist and other abnormal behaviours with a consequent better performance (Bouzerzour *et al.*, 2012; Pluske *et al.*, 2018). The observation agreed with the findings of this study in which there was improvement (non-significant) in the body weight and daily weight gain of pigs fed diet with solid milk waste at 0.5% inclusion level. The improvement in the body weight gain as mentioned above may be because of the influence of the type of protein source (solid milk waste) on both the development of the digestive tract and its microflora as reported by Poulsen *et al.* (2017). While lack of improvement in pigs fed 1% SMW may be ascribed to higher inclusion of the solid milk waste in the diet which might cause diarrhea for the animals, hence poor growth performance. Lack of significant effect of the solid waste milk on the performance of the weaner pigs may be an indication that use of solid waste milk in the weaner's diet as an additive may not be necessary using 'over the top approach' rather than adjusting the diet formulation to reduce nutrients.

CONCLUSIONS AND RECOMMENDATIONS

The use of solid milk waste in the diets of weaner pigs has no demerit on the performance of the animals. Therefore, 0.5% inclusion of solid milk waste in the diets of weaner pig is acceptable for optimum growth performance.

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Table 1. Gross Composition of the Experimental Diets

INGREDIENTS	Diet 1	Diet 2	Diet 3
Maize	45.00	45.00	45.00
Soybean meal	24.00	24.00	24.00
Fishmeal	3.00	3.00	3.00
Palm kernel cake	7.34	7.34	7.34
Maize bran	5.00	5.00	5.00
Wheat bran	10.00	10.00	10.00
Palm oil	2.00	2.00	2.00
Bone meal	1.60	1.60	1.60
Limestone	0.80	0.80	0.80
Methionine	0.03	0.03	0.03
Lysine	0.45	0.45	0.45
Threonine	0.03	0.03	0.03
Premix	0.25	0.25	0.25
Salt	0.50	0.50	0.50
Solid Milk waste	-	0.50	1.00
Total	100.00	100.50	101.00
Calculated values			
Metabolizable energy (Kcal/kg)	2908	2922.54	2937.08
Crude protein (%)	20.21	20.34	20.47
Crude fibre (%)	4.62	4.62	4.62
Lysine (%)	1.48	1.49	1.51
Methionine (%)	0.39	0.40	0.40

Table 2. Performance of the weaner pigs fed with the experimental diets

Parameters	T1	T2	T3	SEM	P-value
Initial weight (Kg)	11.083	12.322	12.038	1.0501	0.9075
Final Weight (Kg)	20.933	24.156	21.167	1.9513	0.8026
Body weight gain (Kg)	9.850	11.833	9.128	0.9897	0.5781
Daily weight gain (Kg)	0.352	0.423	0.326	0.0353	0.5781
Daily feed intake (Kg)	0.976	1.114	0.911	0.1022	0.7650
Feed conversion ratio	2.791	2.638	2.740	0.0565	0.5962

SEM; standard error of means