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DIETARY SUPPLEMENTATION OF *Saccharomyces cerevisiae* FERMENTATION METABOLITES DURING GESTATION AND LACTATION INCREASED SURVIVABILITY AND LITTER WEIGHT AT WEANING OF PIGLETS

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ABSTRACT

A feeding trial was conducted to investigate the effects of dietary supplementation of *Saccharomyces cerevisiae* fermentation metabolites (SFM) during gestation and lactation on piglet performance. Thirty crossbred sows (4.23 ± 0.04 of average parity) were randomly allocated to two dietary treatments following a randomized complete block design, with parity as blocking factor. The treatments include basal gestating and lactating diets added with 0 or 2 kg/ton SFM. The feeding trial started at day 1 of gestation and continued until weaning. Piglets from sows fed SFM had higher adjusted 30-d litter weight (84.48 vs 69.91 kg; *P*<0.05) and tend to have lower preweaning mortality (4.33 vs 10.12%; *P*=0.0992). No differences were detected on other parameters measured. In conclusion, supplementation of 2 kg/ton SFM on gestating and lactating diet has the potential to increase growth and survivability of piglets.

Key words: fermentation metabolites, piglet, *Saccharomyces cerevisiae*, sow

INTRODUCTION

Saccharomyces cerevisiae fermentation metabolites (SFM) were first supplemented to dairy cows to increase milk production (Kim *et al*., 2010). SFM act as multi-functional performance enhancer composed of a mixture of nucleotides, peptides, mannanoligosaccharides, β-glucans, organic acids and polyphenols (Price *et al*., 2010). This mixture of compounds aids in the development of a balanced immune system, stimulates the growth of beneficial bacteria in the digestive system and improves gut integrity resulting to better overall performance of the animals especially under stressful conditions (Kiarie *et al*., 2012). Metabolites from *Saccharomyces cerevisiae* fermentation are now utilized in swine diets. Recent studies conducted in US have shown that sows supplemented with SFM have increased weaning weight of piglets (Kim *et al*., 2008; Stangohr *et al*., 2009; Kim *et al*., 2010; Shen *et al*., 2011; Frank and Dorton, 2013). The improvement in growth performance was attributed to increase in milk production of sows and enhancement of

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immunity (Shen *et al*., 2011). At present, there is no data generated yet in the Philippines. Conducting a local feeding trial of SFM in sows will provide data which can be more applicable in Philippine condition. Hence, the study aimed to determine the effects of supplementing SFM on the performance of sows and piglets during gestation and lactation.

MATERIALS AND METHODS

The influence of SFM supplementation in sows was evaluated in a commercial swine farm located in General Santos City, South Cotabato, Philippines. A total of 30 sows (average parity: 4.23 ± 0.04) were equally allotted to 2 dietary treatments which are basal gestating and lactating diets added with 0 or 2 kg/ton SFM (Diamond V Original XPC, Diamond V, Cedar Rapids, IA, USA; Table 1). Sows in individual stalls were provided with gestating diet at the day of breeding until d 100 of gestation. Lactating diets were offered to sows after transfer to individual farrowing crates from d 101 of gestation until weaning. Data gathered in this study were gestation period, weaning days, litter size at birth, litter size born alive, litter size at weaning, mummified fetus, stillbirth, preweaning mortality, birth weight, adjusted 30-day weaning weight and adjusted 30-day litter weight (computed as adjusted 30-day weaning weight x litter size at weaning). Average lactating feed intake was based on farm records which is 5 kg. The farm practiced controlled feeding during the feeding trial. In addition, no feed refusal was observed in all sows on both treatments.

All data gathered were analyzed using GLM procedure of SAS 9.1.3 (SAS Inst. Inc., Cary, NC, USA). The study followed a randomized complete block design, with parity as blocking factor. Comparison of treatment means was done using Least Significant Difference (LSD) test. Data on mummified pigs, stillbirth and preweaning mortality undergone arcsin transformation. The sow or litter was the experimental unit. The α-level used to determine significance and tendencies between means were considered at $P<0.05$ and $P<0.10$, respectively.

RESULTS AND DISCUSSION

The preweaning mortality of piglets tended to be lower ($P=0.0992$) in sows fed diets with SFM (Table 2). The improvement in piglet survivability can be attributed to enhancement of immunity. Previous experiments indicated that sows supplemented with SFM have higher production in neutrophils, lymphocytes and white blood cells which indicates improvement in health status of animal (Kim *et al*., 2009; Shen *et al*., 2011). On the contrary, findings were different from previous trials conducted in the USA wherein mortality of piglets were the same in sows fed diets with and without SFM (Kim *et al*., 2008; Kim *et al*., 2009; Stangohr *et al*., 2009; Kim *et al*., 2010; Shen *et al*., 2011). The discrepancy can be due to differences in environmental conditions such as temperature, hygiene, biosecurity, etc. Possibly, a more noticeable response can be observed if animals were housed in a more challenged environmental conditions.

Dietary supplementation of SFM in sows did not affect ($P>0.05$) adjusted 30-d weaning weight and litter size at weaning of piglets. On the other hand, adjusted 30-d litter weight was higher ($P<0.05$) in sows fed diets with SFM. The combined increase in litter size at weaning and adjusted 30-day weaning weight resulted to increase adjusted 30-day

Table 1. Composition of experimental diets (as-fed basis).

Item	Gestating	Lactating
Ingredients (%)		
Yellow corn	-	54.67
Wheat	67.00	4.80
Soybean meal (US, 46%)	14.80	27.60
Rice bran D1	10.00	3.00
Palm oil	2.00	5.00
Monodicalcium phosphate	1.65	1.80
Limestone (fine)	1.40	1.40
Vitamin premix[1]	0.03	0.03
Mineral premix[2]	0.03	0.03
Other micro-ingredients	3.09	1.67
Total	100.00	100.00
Calculated nutrient contents		
ME (Mcal/kg)	3.05	3.28
CP (%)	15.01	17.50
EE (%)	4.48	7.79
CF (%)	4.35	3.51
Ca (%)	1.00	1.10
Avail. P (%)	0.50	0.50
Total Lys (%)	0.75	0.99
Total Met + Cys (%)	0.53	0.63
Total Thr (%)	0.58	0.71
Total Trp (%)	0.21	0.23

[1]Supplied per kg of diet: Vitamin A (12, 500 IU), Vitamin D3 (2,500 IU), Vitamin E (50 mg), Vitamin K3 (2.50 mg), Vitamin B1 (25 mg), Vitamin B2 (6.25 mg), Vitamin B6 (5 mg) Vitamin B12 (0.025 mg), Niacin (42.50 mg), Pantothenic Acid (17.50 mg), Folic Acid (1.25 mg), Biotin (0.25 mg), Antioxidant (25 mg),
[2]Supplied per kg of diet:Iron (125 mg), Manganese (25 mg), Iodine (0.175 mg), Selenium (0.30 mg), Zinc (125 mg), Copper (7.50 mg).

litter weight (*P*=0.018) after subjected to statistical analysis. Results were in agreement to previous studies (Kim *et al*., 2008; Kim *et al*., 2009; Stangohr *et al*., 2009; Kim *et al*., 2010; Shen *et al*., 2011; Frank and Dorton, 2013). SFM was also proven for its growth promoting properties (Shen *et al*., 2011). The components of SFM enhances immunity development, intestinal balance of microflora and gut integrity that leads to improvement in growth performance (Kiarie *et al*., 2012). The increase in growth of neonatal pigs was also attributed to increase in milk production of sows (Kim *et al*., 2008; Shen *et al*., 2011). Although effect can be measured indirectly to weaning weight of piglets, no experiment was conducted yet that measured the milk production of sows fed diets with and without SFM.

Table 2. Performance of sows fed diets with and without SFM[1].

Item	SFM (kg/ton)		SEM	*P*-value
	0	2.0		
Parity	4.20	4.27	1.14	0.950
Gestation period (d)	113.47	114.20	0.70	0.230
Weaning days (d)	22.07	21.21	0.67	0.184
Litter size (n)				
At birth	11.07	11.86	0.72	0.246
Born alive	10.50	10.14	0.78	0.626
At weaning	9.00	9.73	0.69	0.270
Mummified (n)	0.12	0.19	0.16	0.558
Stillborn (n)	0.46	1.06	0.06	0.550
Preweaning mortality (%)	10.12	4.33	3.62	0.099
BW of piglets (kg)				
At birth	1.29	1.33	0.06	0.791
Adjusted 30-d weaning weight	7.80	8.64	0.54	0.131
Adjusted 30-d litter weight	69.91	84.48	7.26	0.018

[1]Presented as means and SEM (standard error of mean); BW (body weight)

Litter size born alive and piglet birth weight had no differences ($P>0.05$) between treatments. Results were in agreement with previous studies (Kim *et al*., 2008; Kim *et al*., 2009; Stangohr *et al*., 2009; Kim *et al*., 2010; Shen *et al*., 2011). Maternal nutrition plays a significant role in swine reproductive performance. In line with this, dietary energy intake level effects on fetal development and embryo survival has been well studied. Results show that high energy feeding during the premating period and early pregnancy are often associated with increased embryo mortality (Johnston *et al*., 2008).

The study showed the potential of SFM supplementation in sow's diet during gestation and lactation, particularly in increasing piglet growth and survivability under Philippine conditions. Measurement of milk production and its quality can be done to validate its contribution to improvement in growth performance of neonatal pigs. Further investigations can also be done in sows at multiple production cycles to see effect of SFM in pregnancy parameters.

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