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The use of dehulled full fat soybean meal and lecithin in sow and piglet feeds

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Introduction

Efficiency and profitability are the two main objectives in today's intensive swine production. Factors such as genetics, nutrition, environment, farm managements and health have been researched and continuously improved in order to maintain a profitable swine enterprise. Feed represents 60 to 75 percent of the total cost of pork production, and energy represents the greatest portion of this cost. Therefore energy sources use in pig feeds production must be able to be efficiently utilized for maximum growth and reproductions.

Some of the high energy ingredients which are commonly used in animal rations are grain, full fat soybean meal, oils and fats. Previously full fat soybean meal especially those produced before 1990s' did not significantly improve animals performance due to poor production techniques. However recently a new high efficiency dehulled full fat soybean meal has been shown to improve the performance of broiler, layer, breeder and sow (Ng, 2009). Oils and fats are normally used to supplement pig diets to improve productivity. However, the utilization of dietary fats is limited in young pigs especially those during the post weaning period because of the lack of several digestion enzymes. Thus for better fat absorption, emulsification is required to create the micelles necessary for the absorption of fat.

Soy lecithin is a complex mixture of phospholipids derived from soybean oil processing. It can be served as emulsifier besides providing energy in animal rations. Lecithin supplementation can improve nutrient digestibility and

utilizations, especially oils and fats. Information on the effects of soy lecithin on the digestibility of oils and fats in diets for pigs, especially for sows and pre-starter piglets are inconsistent and limited (Frobish et al., 1969; Overland et al., 1993; Wieland et al., 1993; Overland et al., 1994). There has been no investigation on the effects of soy lecithin added to palm oil used in sow and pre-starter feeds. The purpose of these studies is to test the effects of soy lecithin added to palm oil on the sows' and young pigs' reproductive and growth performance respectively.

The use of lecithin in sow feed

1. Methods and materials

The study was done at a commercial pig farm in Penang, Malaysia. The farm has different types of crates for AI insemination, pregnant and farrowing sows. The farm has an open house system and is equipped with exhaust fan systems where cool air kept the animals cool during the hot times of the day.

The study was repeated in three replicates. Ten sows were allocated for both control and treatment group in each replicate. The sows were of Landrace cross Duroc breed. When the sows and gilts reached 14 days prior to their due date, they were fed with approximately 1 kg of a farrowing diet twice a day. The normal sow's diet was composed of corn, soybean meal, wheat pollard, rice bran, palm oil, corn germ, fishmeal, molasses, and commercial premix concentrate. The treatment diet composed of same types of feed ingredients as the control group with 25% of the palm oil being replaced by soy lecithin. The feed composition and the calculated nutrients of the rations are shown in Table 1.

Once the sows reached farrowing, daily feed intake was slowly increased to 7kg during the 5 days after farrowing. The trial ended at this point. The sow's parity, sow's body condition score, weight per piglet at birth, daily feed consumption of sow, percent of piglets' survivability at farrowing and percent of piglets' survivability at end of the trial were recorded.

Table 1. Lactation feed formulation and calculated nutrients

	Control group	Treatment group
Composition		
Corn	35.68	35.68
SSHE DSBM	16.40	16.40
Wheat Pollard	15.00	15.00
Rice bran	14.00	14.00
Fish meal 60	3.00	3.00
Corn germ	6.00	6.00
Lecithin	0	0.98
Palm oil	3.92	2.94
Pig lactation premix concentrate	5.00	5.00
Molasses	1.00	1.00
Total	100	100
Calculated nutrients		
NE, Kcal/kg	2465	2465
Crude protein, %	18.1	18.1
Crude fat,%	9.2	9.2
Ash, %	6.15	6.15
Calcium.%	1.00	1.00
Phosphorous available, %	0.505	0.505
Digestible lysine, %	0.900	0.900
Digestible methionine, %	0.352	0.352
Digestible M + C, %	0.590	0.590
Digestible threonine, %	0.610	0.610
Digestible tryptophan, %	0.190	0.190
Digestible valine, %	0.750	0.750
Digestible isoleucine, %	0.640	0.640

2. Results and Discussion

The results of the trial are summarised in Table 2.

Table 2. Summary of the trial results

	Control group	Treatment group	Improvement, %
Weight per piglet born, kg	1.592	1.614	1.38
Survivability of piglets at birth, %	92.9	95.6	2.91
Survivability of piglets at 5 days post farrowing, %	87.7	92.1	5.02

The lecithin treatment group increased the weight per piglet born by 1.38%, increased the survivability of piglets at birth by 2.91% and increased the survivability of piglets at 5 days post farrowing by 5.02%. The improvement in sows' and piglets' performance is probably due to the soy lecithin acting as emulsifier for the palm oil giving an easily digestible high energy source as well as providing additional choline.

The use of Lecithin in Pre-Starter feed

1. Materials and Methods

The experiment was conducted in an open-sided house with plastic slatted floor. Each pen was equipped with a self feeder and a nipple water drinker to allow *ad libitum* feed and water consumption. The feeds were fed using a wet feeding practice. Feed consumption was measured weekly. Body weights were measured at start and at the end of the trial.

After the 100 mixed sex weaned piglets were fed 15 days of creep feed, they were transferred to an experimental unit in a commercial pig farm. They were cross breed (Landrace X Duroc) and had an average body weight of 10.7 kg. 50 piglets were randomly allocated in one pen as a control group and 50 piglets in another pen as the treatment group. The trial was carried out until 25 kg of body weight.

In the control group, the piglets were fed pre-starter feed. The pre-starter feed used corn, soybean meal, full fat soybean meal, wheat pollard, fish meal, milk replacer, palm oil and commercial premix. In the treatment group, the piglets were fed with a pre-starter feed prepared as above but with 25% of the palm oil being replaced by lecithin. The lecithin and the palm oil were mixed together before being adding to the compound feed. The feeds were produced in mash form. The feed ingredients and nutrients of the pre-starter feeds are in Table 3.

Table 3. Pre-starter feed formulation and calculated nutrients

	Control group	Treatment group
Composition		
Corn	46.3	46.3
SSHE DSBM	23.3	23.3
Full fat dehulled SBM	5.0	5.0
Wheat pollard	5.0	5.0
Fish meal 60%	2.5	2.5
Soy lecithin	0	1.35
Palm oil	5.4	4.05
Skim milk replacer	7.5	7.5
Pre-starter premix concentrate	5.0	5.0
Total	100	100
Calculated nutrients		
NE, Kcal/kg	2588	2588
Crude protein, %	21.30	21.30
Crude fat, %	8.80	8.80
Ash, %	5.00	5.00
Calcium, %	0.91	0.91
Phosphorous available, %	0.457	0.457
Digestible lysine,%	1.352	1.352
Digestible methionine, %	0.540	0.540
Digestible M + C,%	0.810	0.810
Digestible threonine,%	0.840	0.840
Digestible tryptophan, %	0.260	0.260
Digestible valine, %	0.805	0.805
Digestible isoleucine, %	0.735	0.735

2. Results and Discussion

The results of the trial are shown in Table 4. The lecithin treatment group showed an increase in body weight gain per piglet by 3%, an improvement in average daily weight gain by 2.9%, a decrease in feed intake by 5.65% and improved feed conversion ratio by 8.37%. There were no mortality of piglets for both control and treatment group.

Table 4. Growth performance of pre-starter piglets

	Total weight gain (kg/pig)	Average daily gain (kg)	Total feed intake (kg/pig)	FCR	Mortality
Control group	14.32	0.551	28.743	2.007	0
Treatment group	14.75	0.567	27.118	1.839	0
Improvement, %	3.00%	2.90%	-5.65%	8.37%	0

In this trial, the addition of lecithin may have enhanced the utilization of palm oil by the young pig serving as a highly digestible energy source. Further digestibility experiments are probably needed to further investigate the interaction of soy lecithin as an emulsifier for palm oil in pre-starter piglet diets.

Conclusions

From these two studies, the utilization of soy lecithin to replace 25% of the palm oil in sow feed prior to and after farrowing improved the sows' reproductive performance by increasing the weight of new born piglets, and the survivability of piglets at birth and at 5 days after farrowing were also improved. Similarly the pre-starter piglets' growth rates and feed efficiencies were improved when lecithin was added to the palm oil used in the diets.

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