EFFECT OF DIETARY SUPPLEMENTATION OF LECITHIN ON GROWTH PERFORMANCE IN PIGLETS FED HIGH FAT DIET DURING GROWING PERIOD

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Abstract

An experiment was conducted to study the effect of dietary supplementation of lecithin on growth performance in Large White Yorkshire piglets fed high fat diet. Thirty two weaned piglets were randomly divided into three groups allotted to the three dietary treatments, T1- control ration (NRC, 1998), T2- control ration plus 5 per cent fat and T3- T2 plus 0.5 per cent lecithin. The total dry matter intake, fortnightly body weight of each individual animal were recorded. There was a significant improvement observed for pigs under supplemented group (T2 and T3) than that of control group (T1) with regards to all growth parameters studied such as total dry matter intake, total weight gain, average daily gain and feed conversion efficiency during the growing period.

Keywords: *Lecithin, animal fat, pigs, growth*

Feed is single most expensive input in commercial pork production representing more than 50% of the total cost of production. The greatest proportion of this cost is contributed by energy component of which corn grain make up to 50 to 85% of the ingredients in swine ration. Many alternative energy sources potentially cost effective and useful in swine ration are produced by various industries. One such is animal fats, which is a by-product of rendering process that include lard, choice white grease, beef tallow, poultry fat, is said to contain 2.25 times metabolisable energy as compared to cereal grains. Many researches indicate that addition of animal fat improve feed conversion efficiency, average daily gain, increase feed palatability, carcass fat, reduce dust and bacterial particles in air as well as reduce weaning stress to piglets. Fats are immiscible with water so it requires an emulsifying agent to increase its absorption across intestinal membrane. Lecithin (phosphatidyl choline), a phospholipid extracted from soybeans are used as an exogenous emulsifier to enhance utilisation of dietary fat. Rendered fat mainly contains high content of long chain, saturated, non polar fatty acids that had restricted entry into the micellar phase and consequently its absorption is reduced. Lecithin promotes incorporation of non-polar fatty acids into the micellar phase, thereby facilitating its absorption. Based on these assumptions, the

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following study was undertaken to study the effect of dietary supplementation of lecithin in weaned Large White Yorkshire piglets fed on high fat diet on growth performance during growing stage.

Materials and Methods

Thirty two weaned female Large White Yorkshire piglets of two months of age were selected and randomly divided into three dietary groups as uniformly as possible with four replicates in each group. All piglets were maintained under uniform management conditions throughout the experimental period of 98 days. Each piglet were fed with standard grower ration containing 18 per cent of crude protein (CP) and 3265 kcal of metabolizable energy (ME) per kg of feed. The three groups of piglets were randomly allotted to three dietary treatments as follows: T1 (control ration as per NRC, 1998), T2 (control ration plus 5 per cent animal fat), T3 (T2 plus 0.5 per cent lecithin). All piglets were fed twice daily. Restricted feeding were followed by allowing them to consume as much as possible within the period of one hour and balance feed, if any, were collected and weighed after each feeding. Record of daily feed intake was maintained throughout the experimental period. Moisture content of both feed and left over feed were analysed to calculate total dry matter intake. The piglets were weighed at the beginning of the experiment and subsequently at fortnightly intervals to estimate total weight gain, average daily gain, feed conversion efficiency, respectively.

Data collected on various parameters were statistically analysed by Completely Randomized Design (CRD) method as described by Snedecor and Cohran (1994). Means were compared by Duncan Multiple Range Test (DMRT) using Statistical Package for Social Studies software (Version 21). Ingredient and chemical composition of experimental grower and finisher rations are presented on Table 1 and 2.

Results and Discussion

Data on weekly average feed intake of pigs given the three experimental rations T1, T2 and T3 are presented on Table 3. The total feed intake recorded for the three treatments were 164.73, 177.32 and 180.47 kg, respectively. No significant difference were observed among treatment groups for average dry matter intake during first, second and 12th week whereas supplementary groups (T2 and T3) showed similar and better intake than control group in all weekly intervals except ninth and thirteenth week where lecithin supplemented group (T3) showed higher intake than T1 and T2 group. This is in agreement with the findings of Overland and Sundstol (1995) and Piao *et al*. (2000) who had reported increased average dry matter intake in pigs fed diet incorporated with 5 per cent and 6 per cent tallow compared

Table 1. Ingredient composition of experimental grower and finisher ration, %

Ingredients	Experimental grower rations			Experimental finisher rations		
	T1	T2	T3	T1	T2	T3
Yellow maize	70	70	70	74	74	74
Wheat bran	1.5	1.5	1.5	3.6	3.6	3.6
Soyabean meal	26.25	26.25	26.25	20.5	20.5	20.5
Salt	0.5	0.5	0.5	0.5	0.5	0.5
Dicalcium phosphate	0.9	0.9	0.9	0.65	0.65	0.65
Calcite	0.85	0.85	0.85	0.75	0.75	0.75
Total	100	100	100	100	100	100
Animal fat	0	5	5	0	5	5
Lecithin[1]	0	0	0.5	0	0	0.5
Hyblend AB_2D_3K[2], g	25	25	25	25	25	25
Becon-DS BE[3], g	25	25	25	25	25	25
Zinc oxide[4], g	45	45	45	30	30	30
Rovimix E-50[5], g	10	10	10	10	10	10

to control. Danek *et al*. (2005) suggested that dietary supplementation of lecithin at 0.1 per cent level showed 4 to 9 per cent improvement in total feed intake than the non-supplemented group.

The data with regards to fortnightly average body weight of pigs are presented on Table 4 and data regarding total weight gain, average daily gain and feed conversion efficiency of pigs on Table 5. The statistical analysis of the data revealed that the supplementary groups (T2 and T3) were found to have significantly better average body weight when compared to control group (T1). Present results are in agreement with Leibbrandt *et al*. (1975) and Brumm and Peo (1994) who had reported addition of tallow at 5 per cent level improved final body weight of pigs linearly (P<0.01) compared with non-supplemented group. Reis de Souza *et al*. (1995) observed 60 per cent increase in body weight of pigs fed diet incorporated with 1.5 per cent lecithin along with 6.5 per cent tallow compared with control.

Data on total weight gain, average daily gain and feed conversion efficiency of growing

Table 2. Chemical composition* of pig grower and finisher rations, %

Parameters	Grower rations[1]			Finisher rations[1]		
	T1	T2	T3	T1	T2	T3
Dry matter	90.01±0.02	90.26±0.14	90.34±0.06	89.05±0.46	89.92±0.30	90.58±0.13
Crude protein	17.93±0.17	18.27±0.08	18.22±0.19	16.23±0.03	15.84±0.01	16.44±0.06
Ether extract	3.00±0.21	9.07±0.17	8.16±0.10	3.02±0.01	9.05±0.10	8.07±0.06
Crude fibre	2.48±0.05	1.40±0.04	3.90±0.40	2.51±0.10	2.54±0.12	3.19±0.28
Total ash	6.08±0.74	6.32±1.28	5.64±1.02	5.28±0.06	4.73±0.17	4.87±0.23
Nitrogen Free Extract	70.50±0.44	64.95±1.21	64.84±1.40	72.97±0.13	67.87±0.29	67.49±0.29
AIA	0.98±0.13	0.82±0.06	0.78±0.05	0.91±0.03	0.96±0.13	1.08±0.10
Calcium	0.74±0.02	0.62±0.03	0.78±0.02	0.75±0.02	0.65±0.02	0.77±0.02
Phosphorus	0.67±0.01	0.64±0.03	0.77±0.01	0.65±0.01	0.66±0.01	0.74±0.01
Gross Energy, kcal/kg	3938.06 ± 77.14	4209.64 ± 44.16	4095.42 ± 66.63	3899.98 ± 8.21	4263.24 ± 25.73	4103.35 ± 24.74

*On DM basis, [1]Mean of four values with SE

Table 3. Weekly average dry matter intake of pigs maintained on the three experimental rations, kg

Week	Treatments[1]			
	T1	T2	T3	P value
1	9.02±0.12	9.04±0.07	9.02±0.05	0.96^{ns}
2	9.14±0.05	9.82±0.16	9.62±0.42	0.31^{ns}
3	9.29±0.37^{a}	10.04±0.02^{b}	10.26±0.22^{b}	0.01*
4	9.95±0.10^{a}	10.57±0.20^{b}	10.86±0.18^{bc}	0.004**
5	10.17±0.31^{a}	11.22±0.13^{b}	11.64±0.05^{bc}	0.00**
6	10.99±0.31^{a}	12.28±0.08^{b}	12.57±0.07^{bc}	0.00**
7	11.88±0.32^{a}	13.06±0.30^{b}	13.53±0.01^{bc}	0.003**
8	12.63±0.20^{a}	14.16±0.03^{b}	14.14±0.02^{b}	0.001**
9	13.01±0.01^{a}	14.42±0.03^{b}	14.50±0.02^{c}	0.00**
10	13.28±0.19^{a}	14.75±0.09^{b}	14.89±0.05^{b}	0.002**
11	13.67±0.10^{a}	14.89±0.21^{b}	15.18±0.03^{b}	0.00**
12	13.58±0.12	14.32±0.72	14.92±0.11	0.24^{ns}
13	14.10±0.14^{a}	14.29±0.28^{ab}	14.85±0.02^{c}	0.02*
14	14.02±0.15^{a}	14.48±0.02^{b}	14.49±0.02^{b}	0.00**
Total feed intake	164.73±0.92^{a}	177.34±1.58^{b}	180.47±0.85^{c}	0.00**

[1] Mean of four observations with SE, a,b,c- Means with different superscripts within the same row differ significantly * P<0.05; ** P<0.01; ns- Non significant

Table 4. Fortnightly average body weight of pigs maintained on the three experimental rations, kg

Fortnight	Treatments[1]			
	T1	T2	T3	P value
0	21.59±0.06	21.78±0.12	21.75±0.15	0.74^{ns}
1	27.39±0.12^{a}	31.33±0.14^{b}	32.96±0.52^{c}	0.00**
2	38.38±2.13^{a}	49.00±2.30^{b}	48.33±1.00^{b}	0.004**
3	48.75±0.75^{a}	57.46±2.29^{b}	60.54±0.71^{b}	0.002**
4	59.77±2.14^{a}	68.79±2.03^{b}	73.12±1.81^{b}	0.001**
5	73.50±1.75^{a}	81.84±2.92^{b}	82.88±1.23^{b}	0.04*

[1] Mean of four observations with SE; a,b,c- Means with different superscripts within the same row differ significantly * P<0.05; ** P<0.01; ns- Non significant

Table 5. Total weight gain, average daily gain and feed conversion efficiency of growing pigs maintained on three experimental rations

Parameters	Treatments[1]			
	T1	T2	T3	P value
Average initial body weight, kg	21.59±0.06	21.78±0.12	21.75±0.15	0.74^{ns}
Average final body weight, kg	48.75±0.75^{a}	57.46±2.29^{b}	60.54±0.71^{b}	0.002**
Total weight gain, kg	27.17±0.80^{a}	35.68±2.19^{b}	38.76±0.66^{b}	0.001**
Average daily weight gain, g	447.08±12.71^{a}	566.39±34.78^{b}	615.16±10.43^{b}	0.003**
Total feed intake on DM basis, kg	83.05±0.75^{a}	90.17±0.34^{b}	91.65±0.78^{bc}	0.00**
Feed conversion efficiency	3.06±0.06^{b}	2.53±0.17^{a}	2.37±0.02^{a}	0.01*

[1]Mean of four observations with SE; a,b,c- Means with different superscripts within the same row differ significantly * P<0.05; ** P<0.01; ns- Non significant

pigs maintained on the three experimental rations are given on Table 5. Statistical analysis of data revealed that the treatment groups (T2 and T3) had significantly better total weight gain, average daily gain and feed conversion efficiency than the control group (T1) which are in accordance with the earlier reports of Baudon *et al*. (2003) who had reported 5 per cent increase in total weight gain, average daily gain and FCE by adding 6 per cent tallow in the diet of pigs compared to control. Improved daily gain and FCE in pigs were also reported by Rodas *et al*. (2008) by dietary supplementation of 0.1 and 0.02 per cent lecithin along with 4 per cent fat. Todoravo *et al*. (2011) supplemented diet of crossbred pigs with one per cent lecithin and observed significantly higher total weight gain by 12.3 per cent. Santa (2012) had also reported an increase in body weight gain in pigs by dietary inclusion of animal fat at higher levels (2.5, 5 and 7.5 per cent, respectively) compared to control fed group.

The dietary incorporation of animal fat at 5 per cent level or animal fat along with 0.5 per cent lecithin significantly improved the total dry matter intake, total weight gain, average daily gain and feed conversion efficiency in growing pigs than non-supplemented group.

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