

Lecithin and Carcass Quality in Finishing Pigs

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Executive Summary

Both dressing percentage and feed efficiency during the finisher phase can impact on the profitability of pig production. Naturally derived feed additives, like soy derived lecithin may provide simple and safe tools to enhance the profitability of pig production. Lecithin has been recognized as a feed additive with emulsifying properties which can improve total tract digestibility of diets high in animal fats (Kim et al. 2008).

The current study examined the influence of 0, 0.5 and 1.0% supplemental lecithin in a high fat diet (4% added tallow) of finisher pigs from 60 to 100kg live weight. Supplemental lecithin did not influence the growth performance or feed conversion of pigs ($P > 0.05$). Nor did supplemental lecithin influence the carcass weights, dressing percentage or back fat thickness of pigs ($P > 0.05$).

The efficiency of lecithin to favorably modify fat metabolism may be dependent of a range of variables including diet composition, genetic factors, age and market weight of pigs. The current study was conducted in a commercial facility using modern lean genetics. The results from this study do not support the notion that lecithin should be added to finisher pig diets as a dietary means of enhancing growth performance and carcass measurements of finisher pigs.

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1. Introduction

Lecithin is a fatty substance which naturally occurs in animal and plant tissues. It is composed of phosphoric acid, choline, fatty acids, glycerol, glycolipids, triglycerides and phospholipids. The phospholipids component has been identified as a fat emulsifier and therefore dietary sources of lecithin can be added to animal feeds to aid in mobilizing fats and fat soluble compounds. The addition of supplementary lecithin to animal feeds is believed to benefit both the growth performance and carcass quality of finishing pigs. A preliminary trial conducted at Rivalea by Henry Akit revealed a positive benefit of supplementary lecithin on dressing percentage in pigs.

The current study aimed to determine the quantitative effects of supplementary dietary lecithin on growth performance, feed conversion, true carcass yield and backfat of finishing pigs.

2. Methodology

The experiment was conducted under commercial conditions at the Brinkley Research facility, where 960 pigs were housed in 48 pens (20 pigs per pen). A 3 x 2 factorial design was applied. Pigs were segregated by sex (480 female and 480 entire male) and allocated to one of three dietary treatment groups. Each pair of pens shared a common feeder. The experimental unit for the growth rate and carcass data was the pen (n=48), whilst the feeder (n=24) served as the experimental unit for feed intake and feed conversion data.

The levels of supplementary lecithin were applied to a high energy finishing base diet (14.5 MJ DE/kg including 4% added fat - see appendix I). The three levels of lecithin applied were 0, 0.5 and 1.0%. The lecithin product utilised was ADM Ultralec (Archer Daniels Midland Co., Decatur, Illinois, USA- See appendix II). Treatments were applied from 60kg live weight until slaughter. Pigs were slaughtered at the Big River Abattoir and individual pig carcass data were recovered.

Live weights were recorded at d 0, d 21 and d 42. Feed disappearance was recorded from d 0 - d 21 and d 22 - d 42. Mortality was recorded through out the finisher phase. Carcass weight and backfat (at the P2 position) were recorded and the dressing percentage was calculated on a pen basis.

Data were analysed using mutli-factorial analysis of variance. All data analysis was conducted using Statgraphics Plus (Statgraphics Centurion). Results were considered significant when $P < 0.05$.

3. Outcomes

The growth performance data are shown below in Table 1. Supplementary lecithin did not influence the growth performance or feed conversion of pigs during the finishing phase. Entire males grew at a faster rate ($P < 0.01$) and had heavier final weights ($P < 0.01$) than females. No interaction between supplementary lecithin and sex was observed in the current study.

Table 1 - Growth performance data for finisher pigs offered diets containing supplementary lecithin from 60 kg live weight for 6 weeks.

	Lecithin (%)	Start Weight (kg)	End Weight (kg)	ADFI (kg/pig/d)	ADG (kg/pig/d)	FCR
Females	0.0	61.01	100.88	2.51	0.950	2.65
	0.5	59.66	99.66	2.49	0.953	2.57
	1.0	61.43	101.44	2.54	0.953	2.67
Males	0.0	60.41	103.50	2.30	1.026	2.42
	0.5	62.15	105.40	2.49	1.030	2.54
	1.0	61.87	103.34	2.57	0.987	2.60
	SEM	0.956	1.43	0.12	0.023	0.078
P-values	SEX	0.327	0.006	0.525	0.002	0.091
	TRT	0.586	0.972	0.462	0.609	0.398
	SxT	0.270	0.372	0.542	0.571	0.405

Carcass data is shown in Table 2. Supplementary lecithin did not influence the carcass weight, dressing percentage or backfat of pigs. Females had greater ($P < 0.01$) dressing percentages than entire males. No interactions were detected.

Table 2 - Carcass data for finisher pigs offered diets containing supplementary lecithin from 60 kg live weight for 6 weeks.

	Lecithin (%)	Carcass Wt (kg)	Dressing (%)	Backfat (P2) (mm)
Females	0.0	76.43	75.76	9.89
	0.5	75.64	75.91	10.13
	1.0	77.68	76.57	10.53
Males	0.0	76.96	74.36	10.43
	0.5	78.53	74.50	10.23
	1.0	76.95	74.45	9.88
	SEM	1.181	0.373	0.257
P-values	SEX	0.359	0.001	0.994
	TRT	0.870	0.472	0.981
	SxT	0.309	0.546	0.075

4. Application of Research

The supplementary levels of lecithin used in the present study did not influence the growth performance or carcass characteristics measured here. These findings are in contrast to Kim et al. (2008) who reported significant ($P < 0.01$) improvements in body weight gain and feed conversion of finisher pigs (84.5kg start weight), when diets were supplemented with 2.5% soy derived lecithin for four weeks. D'Souza et al. (2005) also found no influence of supplementary lecithin (1.5%) on the growth performance and feed conversion of grower and finisher pigs from 25 to 105kg live weight. Differences between studies may be related to the different levels of lecithin supplementation, period and/or timing of supplementation and overall diet composition. Differences may also be related to genetic factors which control fat deposition in pigs.

In agreement with Kim et al. (2008) and D'Souza et al. (2005) supplementary lecithin in the present study did not influence carcass weight, dressing percentage of backfat at the P2 position.

There have been a number of studies which have identified improvements in pork quality and fatty acid profile of pork as a result of lecithin supplementation in finisher pig diets (D'Souza, et al. 2005, Edmunds et al. 2005; Kim et al 2008). Meat quality was not assessed in the current study.

Whilst the application of supplemental lecithin in commercial diets would be simple and safe, the results from the current trial do not justify the use of supplementary lecithin at low levels (1% or less) in the commercial diets of finishing pigs as a means of improving growth performance, carcass dressing percentage, carcass weight or carcass backfat.

5. Conclusion

Low levels (<1%) of supplemental lecithin appears to have limited commercial application in Australian finisher pig diets as a means of improve either growth performance or carcass weights, dressing percentage or reducing backfat.

6. Limitations/Risks

The influence of supplemental lecithin may differ in markets where pigs are marketed at heavier weights or where genetic factors may have an influence. Benefits may be greater in those genetic lines where there is a greater propensity to deposit fat in the finisher phase.

7. Recommendations

In general, supplemental lecithin should not be promoted as a dietary modifier for finisher pigs, for those producers wanting to enhance finisher growth performance, efficiency and profitability.

Lecithin does not appear to have any negative effects on growth performance and carcass traits. Therefore research to examine the effects of supplemental lecithin on the nutritional properties of pork for niche marketing purposes may be warranted.

8. References

D'Souza, D.N., Mullan, B.P., McLeish, J., Pethick, D.W. and Dunshea, F.R. (2005) Dietary Lecithin improves the compression properties of pork from the *semitendinosus* muscle. *Manipulating Pig Production X*, Australian Pork Science Association 272, pp. 272

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Kim, W.T., Shinde, P. and Chae, B.J. (2008) Effect of lecithin with or without chitooligosaccharide on the growth performance, nutrient digestibility, blood metabolites and pork quality of finishing pigs. *Canadian Journal of Animal Science*, Vol.88, pp283-292

9. Appendix 1

The three levels of lecithin supplementation (0.0, 0.5, 1.0%) were derived by blending 3 base diets as follows:

Diet blend combinations

Base Feeds	Lecithin level (%)		
	0	0.5	1
Hi-Energy Finisher (%)	80	80	80
Std. Presale (%)	20	10	0
Presale + 5% Lecithin (%)	0	10	20

Composition and theoretical analysis of base feeds

	Hi-Energy Finisher	Std. Presale	Presale + 5% Lecithin
Raw material inclusion (%)			
Wheat 10%	23.30	10.00	10.00
Triticale 11%	30.00	10.43	5.40
Barley 9%	0.00	40.00	40.00
Peas	25.00	7.00	7.00
Millmix	0.00	15.00	16.00
Oat hulls	0.00	1.00	1.00
Canola Expeller 36%	10.00	12.00	13.00
Full Fat Soya	2.50	0.00	0.00
Meatmeal 52%	2.25	0.00	0.00
Bloodmeal	0.60	0.00	0.00
Tallow	4.50	2.00	0.00
Salt	0.20	0.20	0.20
Limestone	1.25	1.73	1.73
Biofos-MDCP	0.00	0.33	0.33
Alimet	0.08	0.00	0.00
Threonine	0.04	0.00	0.00
Lysine Sulphate	0.07	0.09	0.11
Choline chloride 60%	0.01	0.00	0.00
Avizyme 1210L	0.03	0.03	0.03
Phyzyme XP 5000L	0.01	0.01	0.01
Grower Vit/Min Premix	0.20	0.20	0.20
Lecithin	0.00	0.00	5.00
	100.04	100.02	100.01
Digestible Energy (MJ/kg)	14.80	13.00	13.30
Protein (%)	17.70	14.00	14.00
Fat (%)	7.60	5.00	5.70
Fibre (%)	4.30	6.10	6.10

	Hi-Energy Finisher	Std. Presale	Presale + 5% Lecithin
Raw material inclusion (%)			
Calcium (%)	0.89	0.91	0.91
Available Phosphorous (%)	0.35	0.35	0.48
Lysine (%)	1.03	0.73	0.75
Methionine (%)	0.31	0.24	0.24
Meth + Cysteine (%)	0.68	0.58	0.58
Threonine (%)	0.72	0.54	0.54
Isoleucine (%)	0.69	0.55	0.54
Tryptophan (%)	0.19	0.17	0.17
Avail. Lys/ DE (gm/MJ)	0.58	0.45	0.45

Theoretical analysis of final blended diets

	Lecithin level (%)		
	0	0.5	1
Digestible Energy (MJ/kg)	14.45	14.48	14.50
Protein (%)	17.00	17.00	17.00
Fat (%)	7.10	7.10	7.20
Fibre (%)	4.70	4.70	4.70
Calcium (%)	0.89	0.89	0.89
Available Phosphorous (%)	0.35	0.35	0.38
Lysine (%)	0.97	0.97	0.97
Methionine (%)	0.30	0.30	0.30
Meth + Cysteine (%)	0.66	0.66	0.66
Threonine (%)	0.69	0.69	0.69
Isoleucine (%)	0.66	0.66	0.66
Tryptophan (%)	0.18	0.18	0.18
Avail. Lys/ DE (gm/MJ)	0.56	0.56	0.56