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The Use of Ileal Digestibility Values of Protein and Amino Acids of Soybean, Peanut and Sesame Meals for Formulating Grower and Finisher Diets for Pigs

Summary
This experiment was conducted to compare the use of Ileal digestibility values of protein and amino acids of soybean (SBM), peanut (PM) and sesame meals (SM) in diets of growing and finishing pigs. Sixteen crossbred barrows and gilts averaging 30 Kg initial weight were randomly allocated in a randomized complete block design to receive one of four diets containing different digestibility protein and amino acid values from four different sources. The diets were diet 1 (control diet using the protein and amino acid composition values of soybean meal), diet 2 (using the digestibility protein and amino acid values of soybean meal), diet 3 (using the digestibility protein and amino acid values of peanut meal) and diet4 (using the digestibility protein and amino acid values of sesame meal). The pigs were fed *ad libitum* until 90 kg body weight. Total feed intake (TFI), average daily gain (ADG) and feed conversion ratio (FCR) of the pigs fed on each diets throughout the finishing period were not significantly different ($P>0.05$). However feed cost on diet 3 was lowest. The pigs from control group had lower dressing percentage than those fed diets 2 and 4 ($P<0.05$) but did not differ significantly from the pigs on diet 3. Based on the findings from this study, the use of apparent Ileal protein and amino acid digestibility values for formulating pig feeds give the better results than use of composition values, especially in cases where PNM or SM substitute for SBM.

1. Introduction
While there are a number of technical difficulties to resolve regarding apparent and true digestibility values, the main issue of concern is the overall usefulness of ileal digestibility values in the formulation of diets for pigs. Data from Tartrakoon et al. (1997) indicated that apparent ileal protein and amino acids digestibility values of Soybean Meals (SBM), Peanut Meals (PNM) and Sesame Meals (SM) for pigs varied between 52-90, 73-99 and 34-77 % respectively. Tanksley and Knabe (1984) suggested that digestibility values should be used when the lower quality meals replace a portion of the SBM because of the wide variation in amino acids digestibility among SBM and the other meals. More feeding trials should be conducted before the ultimate value of formulating practical diets on the basis of digestible crude protein and amino acids can be assessed, and a decision reached in substituting some portion of lower quality meals such as PNM and SM for SBM without sacrificing pig performance. This experiment was conducted to determine the responses of pigs to grower and finisher diets formulated using ileal digestibility values of protein and amino acids of, SBM PNM and SM .

2. Material and Methods
Sixteen barrows and 16 gilts of the Largewhite x Landrace x Duroc breed type were obtained from the Animal Science Department, Chiang Mai University, Thailand and randomly divided into four groups, and each fed one of the four experimental diets (Table 1). All diets, except the control diet, were formulated using apparent ileal digestibility value of protein and amino acids of SBM, PNM and SM previously established (Tartrakon et al., 1997). The control diet was formulated using the conventional protein and amino acid

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compositions. Soybean meal and corn meal (SBM-C) were used in each diets as the basal compositions. Diet 3 and 4 contained 10 per cent of PNM and SM respectively. Nutrient composition of all diets was calculated based on the NRC (1988) recommendations. Dietary treatments in the pigs began at an initial average live body weight of 30 kg.± 0.14 and continued until a final average live body weight of 90 ± 0.12 kg. Two male and female pigs were sampled from each group and sacrified for carcass evaluation. The carcass characteristics were determined according to the procedure of Jaturasitha (1991). Data were analyzed using a model specific for a Randomized Complete Block Design using ANOVA procedure of SAS (1986).

Table1. Ingredient composition of experimental diets (g/kg air dry) in growing and finishing period (in brackets).

Ingredient	Diet			
	Diet 1 (control)	Diet 2	Diet 3	Diet 4
Soybean meal	224.6 (168.1)	252.1 (180.0)	116.0 (45.7)	224.4 (153.8)
Peanut meal	0 (0)	0 (0)	100 (100)	0 (0)
Sesame meal	0 (0)	0 (0)	0 (0)	100 (100)
Corn	735.8 (800.5)	708.2 (786.4)	755.4 (829.3)	639.1 (713.8)
Palm oil	120 (80)	120 (100)	0 (0)	150 (150)
L-lysine	2.6 (1.9)	2.7 (2.1)	3.6 (3.0)	2.5 (1.9)
Dicalcium Phosphate	7.0 (2.5)	7.0 (2.5)	7.0 (3.0)	5.0 (1.0)
$CaCO_3$	9.0 (10.0)	9.0 (10.0)	9.0 (10.0)	5.0 (6.0)
Normal salt	4.0 (4.0)	4.0 (4.0)	4.0 (4.0)	4.0 (4.0)
Vitamin-mineral mix	5.0 (5.0)	5.0 (5.0)	5.0 (5.0)	5.0 (5.0)

3. Results.

Data on feed intake, average daily gain, feed conversion ratio and cost per gain of the pigs in growing period is shown in table 3. Table 4 shows the results for the pigs in the finishing period. Total feed intake, average daily gain and feed conversion ratios of growing pigs were sigificantly different across treatments ($P<0.05$). The pigs fed on diets 4 showed the highest ($P<0.05$) performance in terms of average daily gain and feed conversion ratio. For the finishing period, the pig fed on Diet 1 (control diet) showed the highest ($P>0.05$) average daily gain, while the pigs fed on Diet 3 had the lowest feed cost per gain. Dressing percentage and lean carcass percentage of the pigs fed on Diet 2 were highest across treatment means ($P<0.05$). However the percentage of total fat of pigs from this group was lowest ($P>0.05$).

Table 2 Nutrient and digestibility composition (in brackets) of experimental diets (g/kg air dry)

Item	**Diet**

	Diet 1 (control)	Diet 2	Diet 3	Diet 4
Grower Diet				
Crude protein	159.7 (141.9)	169.7 (149.7)	166.8 (149.7)	189.3 (149.8)
ME (Kcal/kg)	3238	3236	3237	3238
Lysine	7.5 (7.0)	8.0 (7.5)	7.8 (7.5)	8.3 (7.5)
Methinine + Cystine	6.4 (5.8)	6.7 (6.1)	6.5 (6.2)	7.5 (6.4)
Tryptophane	2.1 (1.8)	2.3 (1.9)	1.9 (1.7)	2.7 (2.1)
Threonine	6.3 (5.2)	6.8 (5.5)	5.8 (4.8)	7.8 (5.5)
Isoleucine	7.2 (5.0)	7.7 (5.2)	7.0 (5.6)	8.5 (5.5)
Leucine	15.0 (13.9)	15.5 (14.2)	15.3 (14.3)	16.4 (14.2)
Arginine	10.4 (9.6)	11.1 (10.3)	12.0 (11.5)	11.0 (10.0)
Phenylalanine+ Tyrocine	16.6 (15.4)	17.6 (16.2)	14.6 (13.8)	19.6 (16.2)
Histidine	4.5	4.7	4.4	5.3
Valine	13.9 (13.0)	14.1 (13.1)	14.4 (13.5)	14.9 (13.0)
Finisher Diet				
Crude protein	139.5 (126.2)	143.8 (129.5)	141.3 (129.8)	163.7 (129.8)
ME (Kcal/kg)	3241	3247	3254	3256
Lysine	6.0 (5.7)	6.4 (6.0)	6.2 (6.0)	6.6 (6.0)
Methinine + Cystine	5.8 (5.4)	5.9 (5.5)	5.8 (5.7)	6.8 (5.9)
Tryptophane	1.8 (1.6)	1.9 (1.6)	1.5 (1.4)	2.3 (1.8)
Threonine	5.4 (4.6)	5.6 (4.7)	4.6 (4.0)	6.7 (4.7)
Isoleucine	6.3 (4.7)	6.5 (4.7)	5.9 (5.1)	7.3 (5.0)
Leucine	14.1 (13.2)	14.3 (13.4)	14.1 (13.5)	15.2 (13.3)
Arginine	8.8 (8.3)	9.1 (8.6)	10.1 (9.8)	9.0 (8.3)
Phenylalanine + Tyrocine	14.5 (13.6)	15.0 (14.0)	12.0 (11.5)	17.0 (14.0)
Histidine	4.0	4.1	3.8	4.7
Valine	13.4 (12.7)	13.5 (12.7)	13.7 (13.1)	14.3 (12.6)

Table 3 Productive performance of growing pigs (30 - 60kgBW).

Item	Diet				SEM
	Diet 1 (control)	Diet 2	Diet 3	Diet 4	
Total feed intake	85.13^{ab}	79.25^{b}	92.03^{a}	77.11^{b}	4.16
Experimental days	48^{b}	47^{b}	55^{a}	45^{b}	3.59
Feedintake,kg/day	1.80	1.72	1.72	1.74	0.13
Average daily gain, kg/day	0.64^{ab}	0.65^{ab}	0.56^{b}	0.68^{a}	0.04
Feed conversion ratio	2.85^{ab}	2.64^{b}	3.05^{a}	2.58^{b}	0.13
Cost, bath/kg of weight gain	25.17	24.02	23.65	22.92	1.23

$^{a, b,}$ Means in the same row with differing superscript differ significantly ($P<0.05$), SEM = Standard error of mean.

Table 4. Productive performance and carcass characteristics of finishing pigs (60-90 kg BW).

Item	Diet

	Diet 1 (control)	Diet 2	Diet 3	Diet 4	SEM
Experimental days	46	47	51	51	3.99
Total feed intake, kg	100.09	103.31	98.16	102.70	5.37
Feed intake, kg/day	2.23	2.21	2.00	2.09	1.78
Average daily gain, kg/day	0.67	0.64	0.61	0.61	0.05
Feed conversion ratio	3.34	3.44	3.28	3.42	0.18
Cost (bath/kg of weight gain)	27.12	28.58	23.07	26.13	1.36
Slaughter wt, kg	87	88	87	89	
Hot carcass wt, kg	64.87	68.83	65.99	69.31	
Dressing percentage	74.57[b]	78.15[a]	75.84[ab]	77.88[a]	0.79
Carcass length, cm	74.17	77.63	78.00	75.88	1.41
Longissimus muscle area, cm	46.11	44.10	43.59	48.64	2.81
Average backfat thickness, cm	2.59	2.30	2.55	2.67	0.07
Lean, % of carcass	41.11	41.19	39.92	39.72	1.13
Total fat, % of carcass	14.20	13.98	14.86	15.72	1.24

[a, b,] Means in the same row with differing superscript differ significantly ($P<0.05$), SEM = Standard error of mean.

4. Conclusion

1. The Grower diets formulated by using the ileal digestibility values of protein and amino acids of SBM and SM influenced the growth performance and economic returns of pigs positively and significantly ($P<0.05$).
2. The formultion of the Finisher diet by using the ileal digestibility values of protein and amino acids of SBM, PNM and SM reduced feed cost per live body weight gain, especially when 10 per cent of PNM and SM were used for substitution of SBM.
3. The dressing percentage of pigs fed on diets formulated by using ileal digestibility values of protein and amino acids of SBM, PNM and SM meals were higher significantly ($P <0.05$) than those of the control diet.

5. References

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