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Performance of Gilts and Castrates when fed separately on Two Different Levels of Feeding

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RINGKASAN

Dua puloh ekor babi jantan yang telah dikasi dan dua puloh ekor babi dara yang mempunyai purata berat 52 kg. telah digunakan dalam satu kajian dengan cara pemberian makanan kepada ternakan tersebut di peringkat penggemok.

Babi yang diberi makanan secara bebas (iaitu tidak terhad) menunjukkan kadar tumbesar yang cepat tetapi karkasnya mempunyai purata ketebalan lemak yang lebih di bahagian belakang jikalau dibandingkan dengan babi yang diberi makanan terhad. Bagi setiap peratus makanan terhad yang dipratikkan, kadar tumbesar turun sebanyak 1% dan purata ketabalan lemak di bahagian belakang turun sebanyak 0.91%.

Prestasi babi dara dari segi kadar tumbesar dan effisiensi makanan dan mutu karkasnya adalah lebih tinggi jikalau dibandingkan dengan babi jantan yang telah dikasi.

Pengambilan tenaga boleh hadam bagi babi adalah kurang daripada pengambilan tenaga bagi babi yang sama berat di dalam iklim temperat.

Untuk meninggikan kecekapan pengeluaran ternakan babi, kami mengesyorkan bahawa babi dara dan babi jantan yang telah dikasi seharusnya diasingkan pada peringkat penggemok dan babi jantan itu diberi makanan yang lebih terhad dibandingkan dengan babi dara untuk mengelakkan dari pengendapan lemak.

SUMMARY

Twenty castrated male pigs and twenty gilts initially averaging 52 kg were fed individually so that that performance and carcass quality of pigs fed on a scale based on ad libitum *feeding could be compared to those fed on a restricted regime under local environmental conditions.*

Pigs fed on a scale based on ad libitum *feeding showed a significantly faster growth rate and had more backfat compared to pigs on restricted feeding. For each 1% of feed restriction there was a corresponding 1% reduction in average daily gain and 0.91% reduction in average backfat thickness.*

Gilts excelled over castrates in performance and carcass quality; the former grew faster, were more efficient in feed utilization and produced carcasses with less backfat and larger loin eye area compared to the latter.

The digestible energy intake of pigs was less than animals of similar live weight in temperate environments.

In order to improve efficiency of production, it is suggested that castrates and gilts be fed separately during the finishing stage with the castrates subjected to a more severe level of feed restriction in order to limit fat deposition.

INTRODUCTION

One of the major constraints in swine production at present is the high cost of feed. Where farmers are totally dependent on proprietory feeds, there is little which they can do to reduce feed cost except to bring about greater efficiency in management. One aspect of improving efficiency which is gaining popularity in Europe is the separate feeding of castrates and gilts (Fuller and Livingstone, 1978). Under the intensive system of pig production in this country, castrates and gilts are penned together and allotted the same quantity of feed based on live weight or age. In the bigger farms and among more knowledgeable pig farmers, some form of restricted feeding is usually practised during the finishing stage. However, local farmers generally do not follow a standard scale of feeding; when the market price of pigs is high, pigs are usually fed more liberally so that they reach market weight earlier. Increasing the growth rate by increasing the plane of nutrition also produces a fatter carcass and consequently the farmer obtains a lower price for the animal. However, if the market price is sufficiently attractive, the farmer might still be able to obtain more profit from this practice rather than subjecting his pigs to a more restricted scale of feeding.

The object of this study was to compare the performance of castrates and gilts when fed separately with two feedings scales under local environmental conditions.

MATERIALS AND METHODS

Animals

An initial study using ten castrated males and ten gilts averaging 50 kg was conducted to find out the average daily feed intake based on live weights when given *ad libitum* feeding. The animals were kept in individual stalls; the daily feed allocation was weighed before being offered and leftovers were collected and weighed the following morning to determine the amount of feed consumed. At the end of each week, the total amount of feed consumed by the castrated males and gilts was summed up separately and the average daily feed intake for that week was calculated. The pigs were weighed once weekly to monitor the changes in feed intake with changes in weight gains. This feeding trial continued until the pigs reached 90 kg.

For the main experiment, 20 castrated males and 20 gilts from Landrace x Duroc sows mated to Chester White boars were selected. The pigs were placed in individual stalls when they reached 52 kg. Ten of the castrated males and ten gilts were given food on the pre-determined scale of *ad libitum* feeding of the preliminary trial while the other ten castrated males and ten gilts were given 85% of the amount of the pre-determined scale of full feeding also based on live weights. The animals were weighed once weekly and feed allowances for the subsequent week was calculated. All the pigs on the main trial were sent for slaughter when they reached 90 kg. The animals were starved for about 30 hours prior to slaughter.

Metabolism experiment

Four castrated males averaging 40 kg were used to determine the apparent digestibility of proximate components and gross energy of the experimental diet. The pigs were kept in individual metabolism crates. The daily food allowance for each pig was equal to 3.0 per cent of its live weight at the beginning of a 12 day feeding period. During the last five days of the period the total faeces from each pig were collected and dried in labelled aluminium trays in a forced draft oven at 60° C. At the completion of the feeding period the faeces collected from each pig was weighed to obtain the total faecal dry matter. The faeces was mixed and a representative sample taken and ground in a laboratory grinder and sent for analysis. All samples of food and faeces were subjected to proximate analysis using the methods of the Association of Official Analytical Chemists (1975). Gross energy of the diet and faeces was determined by ballistic bomb calorimetry.

The food used throughout all the trials was a pig-grower mash purchased from Gold Coin Malaysia Sdn. Bhd. The ingredient composition of the diet was not known.

Carcass measurements

After slaughter the following carcass measurements were taken: dressing percentage based on hot carcass weight, backfat thickness, length and cross-sectional area of the loin-eye muscle.

Statistical analysis

Treatment effects were assessed by analysis of variance.

RESULTS

Apparent digestibility of major proximate components of diet

The apparent digestibility of proximate components and digestibility of gross energy of the diet used are given in Table 1.

TABLE 1
Chemical composition and apparent digestibility of experimental diet.

Item	Chemical composition	Apparent digestibility
Dry matter (%)	90.1	74.0 ± 0.23
Crude Protein (%)	16.5	76.9 ± 0.38
Ether Extract (%)	2.6	65.3 ± 0.52
Crude Fibre (%)	5.6	17.5 ± 0.27
Ash (%)	7.7	32.5 ± 1.0
N.F.E. (%)	67.6	83.1 ± 0.2
Gross energy (kcal/g)	4.3	75.3 ± 0.15
Digestible energy (kcal/g)	3.2	

The main results for the parameters measured for each sex and treatment are given in Table 2. Table 3 gives the analyses of variance for the parameters measured.

Pig performance

When pigs were fed based on the scale of *ad libitum* feeding, gilts at lower live weights consumed slightly more feed than castrates. However, when the entire period was taken into account, the feed intake between the two sexes was not significantly different. Gilts on either the scale of *ad libitum* feed intake or on restricted feeding grew faster and utilized feed more efficiently ($P < 0.05$) than castrates. However, there was no significant difference in feed utilization in either castrates or gilts when comparison was made between the two feeding regimes. Both castrates and gilts fed to the scale based on *ad libitum* feeding reached 90 kg live weight on the average ten days earlier than those on restricted feeding.

Carcass Characteristics

Dressing percentage generally favoured castrates over gilts, but overall there was no statistical significance between the two sexes; there was also no statistical significance in this parameter when a comparison was made between the two feeding regimes. Gilts had slightly longer carcasses than castrates but the difference was again not significant. Average backfat thickness was highly influenced by both the plane of feeding and by sex. Pigs fed to the scale based on *ad libitum* feeding had significantly ($P < 0.001$) thicker backfat compared to pigs on restricted feeding; similarly, castrates on both feeding regimes had thicker backfat than gilts. Gilts had significantly ($P < 0.001$) greater loin eye area than castrates but this parameter was not influenced by level of feeding.

No interaction was found between feeding regime and sex in all the parameters studied.

Digestible energy intake of castrates and gilts when fed on a scale based on ad libitum *feeding*

Fig. 1 shows the digestible energy intake of castrates and gilts when fed to a scale based on *ad libitum* feeding. At lower live weights, gilts tend to have greater energy intake than castrates. However, at higher live weights, the energy intake by castrates is about the same as gilts and overall there is no statistical significance between the sexes.

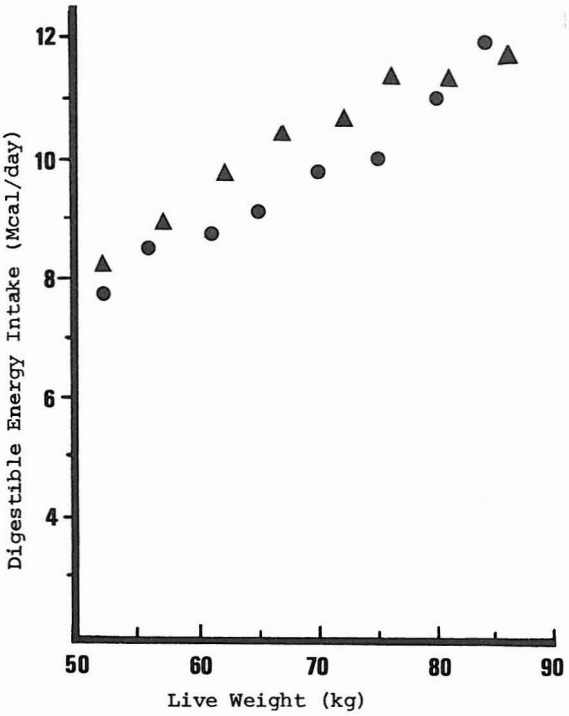

Fig. 1. The relationship between live weight changes and daily energy intake in gilts (▲) and castrates (●) when fed to a scale of ad libitum *feeding.*

TABLE 2

Mean values of characters measured in pigs of two sexes subjected to two feeding regimes from 50 to 90 kg.

	Average daily Feed (kg)			Average daily gain (kg)			Feed conversion			Dressing percent			Carcass length (cm)			Average back fat thickness (cm)			Loin eye area (sq. cm)		
	Ad libitum	Restricted.	Mean for Sex	*Ad libitum*	Restricted.	Mean for Sex	*Ad libitum*	Restricted	Mean for Sex	*Ad libitum*	Restricted.	Mean for Sex	*Ad libitum*	Restricted.	Mean for Sex	*Ad libitum*	Restricted	Mean for Sex	*Ad libitum*	Restricted.	Mean for Sex
Castrates	3.04	2.66	2.85	0.64	0.54	0.59	4.75	4.93	4.84	75.42	74.27	78.84	76.86	75.83	76.35	3.98	3.38	3.68	32.30	29.40	30.85
Gilts	3.14	2.76	2.95	0.70	0.59	0.65	4.49	4.67	4.58	73.58	73.95	73.77	77.30	77.01	77.16	3.19	2.82	3.00	36.30	37.70	37.00
Mean values for feeding regime.	3.09	2.71	–	0.67	0.57	–	4.62	4.80	–	74.50	74.11	–	77.08	76.42	–	3.59	3.10	–	34.30	33.55	

TABLE 3

Mean Squares for characters measured in pigs of two sexes subjected to two feeding regimes.

Source of Variations	Degrees of freedom	Average daily gain	Feed conversion	Dressing percent	Carcass length	Backfat thickness	Loin-eye area
Subgroups	3	0.048*	0.097^{ns}	6.29^{ns}	4.10^{ns}	2.37***	143.36**
Feeding regime	1	0.112*	0.022^{ns}	1.53^{ns}	4.36^{ns}	2.36***	5.63^{ns}
Sex	1	0.29**	0.245*	11.59^{ns}	6.56^{ns}	4.61***	378.23***
Feeding regime x sex	1	0.002^{ns}	0.025^{ns}	5.74^{ns}	1.37^{ns}	0.14^{ns}	46.23^{ns}
Error	36	0.005	0.018	3.13	3.49	0.13	12.96

* $P \leqslant 0.05$

** $P \leqslant 0.01$

*** $P \leqslant 0.001$

ns = not significant.

DISCUSSION

The results of this study show the advantages in terms of carcass quality that are derived with restricted feeding and the superiority of gilts over castrates both in performance and carcass characteristics. The non-significant different in feed conversion efficiency between the pigs on the two feeding regimes could be attributed to the low level of feed restriction imposed; similar findings have been reported by Barber *et al.*, (1972) and Braude *et al.*, (1975). The feed conversion values obtained in this study were higher than those obtained by other workers whose studies involved pigs of similar live weights. Becker *et al.*, (1962) and Speer (1963), obtained feed ratios of 3.56 and 3.97 respectively. The poorer results in the present study could be attributed to the quality of the feed (unknown ingredient composition) and/or, the method of feeding which invariably resulted in some wastage. Phuah and Jiken (1980) reported that the ingredient composition of a ration could affect its feeding value; working with isocaloric diets with similar protein levels these workers reported feed to gain ratios of from 3.45 to 4.75.

Carcass quality in terms of reduction in backfat thickness is the major objective of restricted feeding. In this study, a 0.91% reduction in backfat thickness for each 1% feed restriction was obtained. Vanschoubroek *et al.*, (1967) obtained a calculated value of 0.73% reduction in backfat thickness for each 1% feed restriction when feed restriction was based on 5% level. These workers also showed that with more severe feed restriction a relatively greater fat deposition occurred and attributed this to a decrease in growth due to lack of essential nutrients.

In comparing performance and carcass traits between the two sexes, gilts showed overall superiority over castrates. Superior carcass characteristics in gilts obtained in this study are in agreement with those of other investigators. (Bruner *et al.*, 1958; Cahill *et al.*, 1960; Hale and Southwell, 1967 and Fuller and Livingstone (1978). Palsson (1965) explained that castration in the pig brings about earlier induction of somatic maturity, resulting in a shorter animal with smaller skeleton and which fattens more quickly and tends to convert feed less efficiently than the entire male. Under commercial farm conditions, it is usually observed that castrates grow faster than gilts. This is because when the two sexes are penned together the more aggressive eating behaviour of the castrates leads to their eating more then their share of feed especially in farms where some form of restricted feeding is practiced.

The 19.8% thicker backfat in the castrates when the two sexes were subjected to about the

same level of feed restriction, shows that they should be separated at the beginning of the finishing period (approximately 50 kg) and the castrates subjected to a more severe level of feed restriction to limit fat deposition. This has been suggested by Fuller and Livingstone (1978), in order to achieve equal degree of carcass fatness, these workers have recommended that gilts should have metabolizable energy intake of between 0.72 to 1.43 Mcal/day more than castrates. The effect of imposing these different rates of energy intake would be to further widen the gap in growth rate between the sexes. Within the local context, further studies need to be conducted to determine appropriate levels of energy intake for castrates which would enable them to attain a level of backfat thickness acceptable to local butchers without at the same time delaying their growth rate too drastically.

The digestible energy intakes of castrates when fed to a scale based on *ad libitum* feeding were slightly lower than values obtained under a temperate environment. Cole *et al.*, (1967) reported digestible energy intakes of 10,230 and 12,120 kcal per day for castrates at 62 and 85 kg live weights respectively. At similar live weights in the present study, digestible energy intakes were 8,779 and 11,954 kcal per day respectively. Considering that an unknown quantity of feed was wasted but included in the calculation of digestible energy intakes, the actual digestible energy intake must be even lower. This lower energy intake could be due to the high environmental temperature (average temperature, 29.5° C; range from 22.0 to 33.5° C) which means lower energy requirement for maintenance.

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REFERENCES

A.O.A.C. (1975): *Official Methods of Analysis.* Association of Official Analytical Chemists. (12th ed.) Washington. DC. U.S.A.

BARBER, R.S., BRAUDE, R., MITCHELL, K.G. and PITTMAN, R.J. (1972): Effect of the Level of Feed Intake on the Performance and Carcass Composition of Growing Pigs. *Anim. Prod.* **14:** 199-208.

BECKER, D.E., JENSEN, A.H. and BREEDENSTEIN, B.I. (1962): Effect of protein, energy and restricted feeding on carcass quality of the pig. *Feedstuffs.* **34**, No. 39: pp 18-55.

BRAUDE, R., MITCHELL, K.G. and PITTMAN, R.J. (1975): A Note on Rationing of Growing Pigs according to Age. *Anim. Prod.* **21:** 337-339.

BRUNER, W.H., CAHILL, V.R., ROBISON, W.L. and WILSON, R.F. (1958): Performance of barrow and gilt littermate pairs at the Ohio Swine Evaluation Station. *J. Anim. Sci.* **17:** 875.

CAHILL, V.R., TEAGUE, H.S., KUNKLE, L.E., MOXON, A.L. and RUTLEDGE, E.A. (1960): Measurement of and ways of affecting sex influenced performance of growing-finishing swine. *J. Anim. Sci.* **19:** 1036.

COLE, D.J.A., DUCKWORTH, J.E. and HOLMES, W. (1967): Factors affecting voluntary feed intake in pigs. 1. The effect of digestible energy content of the diet on the intake of castrated male pigs housed in holding pens and in metabolism crates. *Anim. Prod.* **9:** 141-148.

FULLER, M.F. and LIVINGSTONE, R.M. (1978): Effects of progressive feed restriction on the growth and carcass composition of pigs: comparative responses of gilts and castrates. *J. Agric. Sci., Camb.* **91:** 337-341.

HALE, O.M. and SOUTHWELL, B.L. (1967): Differences in swine performance and carcass characteristics because of dietary protein level, sex and breed. *J. Anim. Sci.* **26:** 341-344.

PALSSON, H. (1965): *"Progress in the Physiology of Farm Animals"* J. Hammond. (2 ed.) London. Butterworths.

PHUAH, C.H. and JIKEN, R. (1980): Frequent changes of rations for growing-finishing pigs: changes in ration formulation. *Malays. Agric. J.* **52(3):** 223-227.

SPEER, V.C., (1963): Limited VS full feeding of growing-finishing swine. *Feedstuffs.* **35,** No. 41: 36-44.

VANSCHOUBROEK, F., DE WILDE, R. and LAMPO, PH. (1967): The quantitative effects of feed restriction in fattening pigs on weight gain, efficiency of feed utilization and backfat thickness. *Anim. Prod.* **9:** 67-74.

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